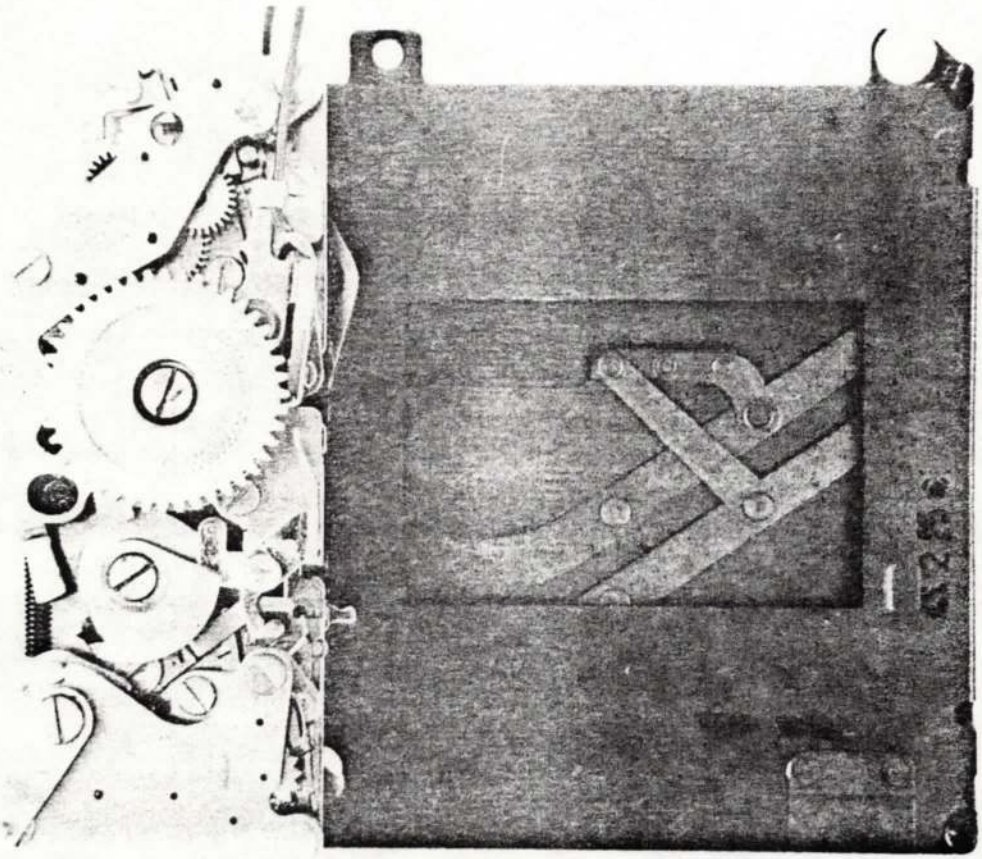
COPAL SQUARE S



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NATIONAL CAMERA
TECHNICAL TRAINING DIVISION
2000 W. Union Avenue • Englewood, Colorado 80110 U.S.A.

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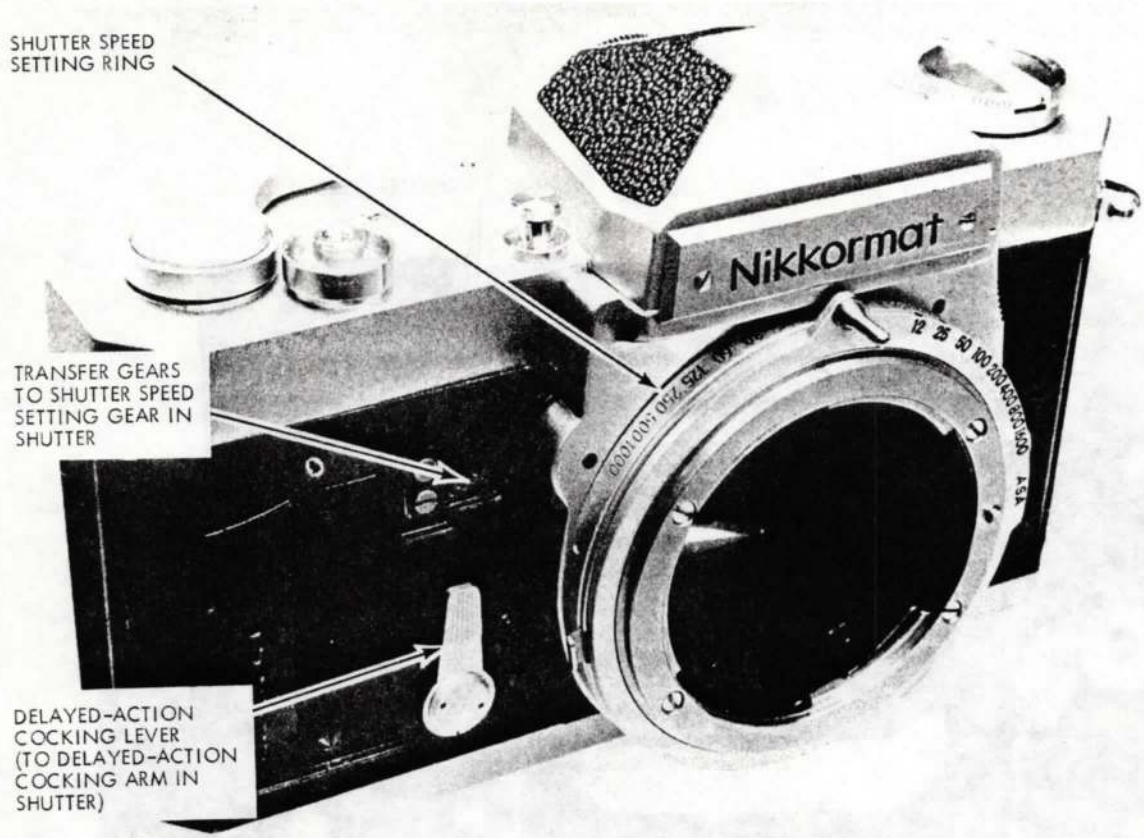
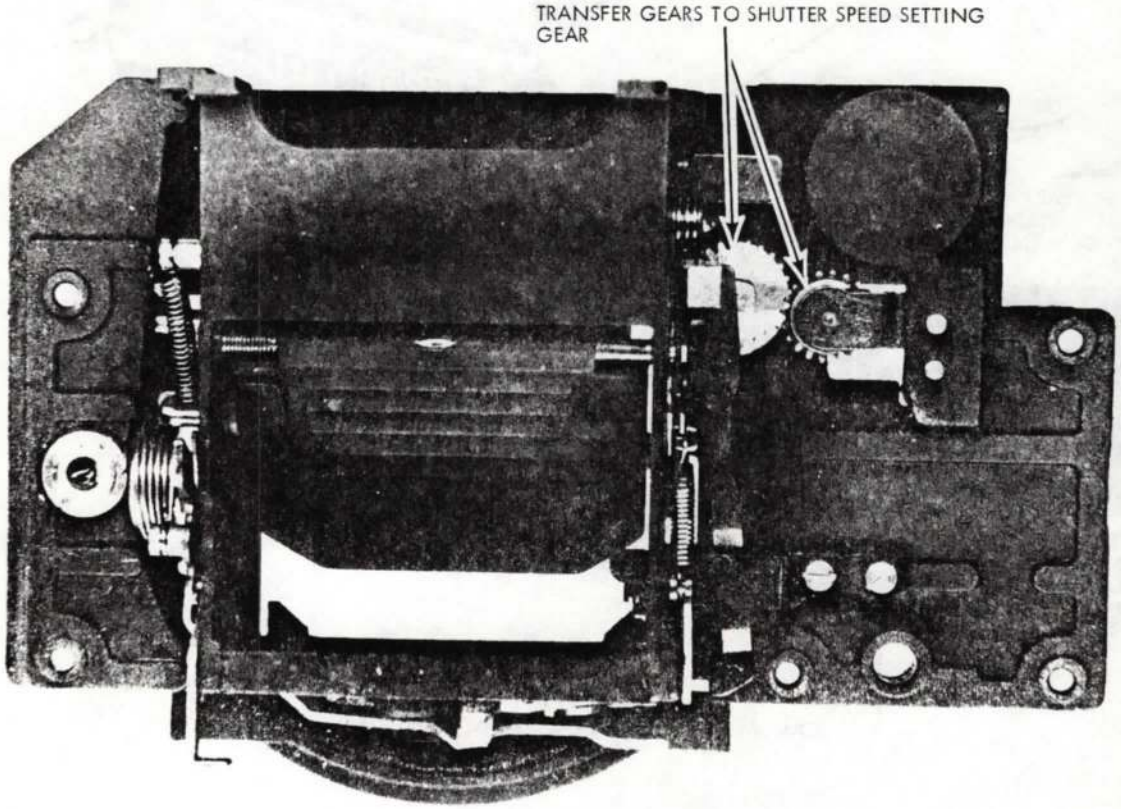
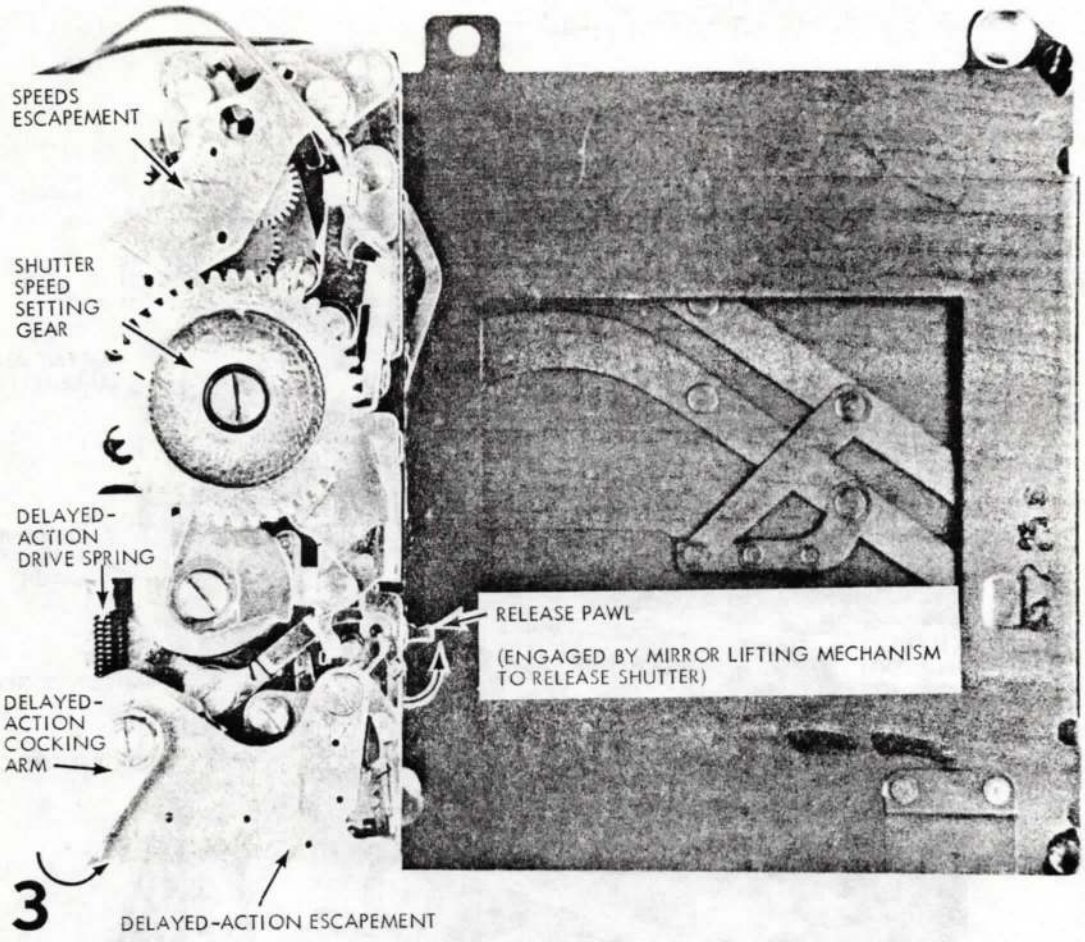

SHUTTER SPEED SETTING RING
TRANSFER GEARS TO SHUTTER SPEED SETTING GEAR IN SHUTTER
DELAYED-ACTION COCKING LEVER (TO DELAYED-ACTION COCKING ARM IN SHUTTER)
Nikkormat
12 25 50 100 200 400 800 1600 ASA

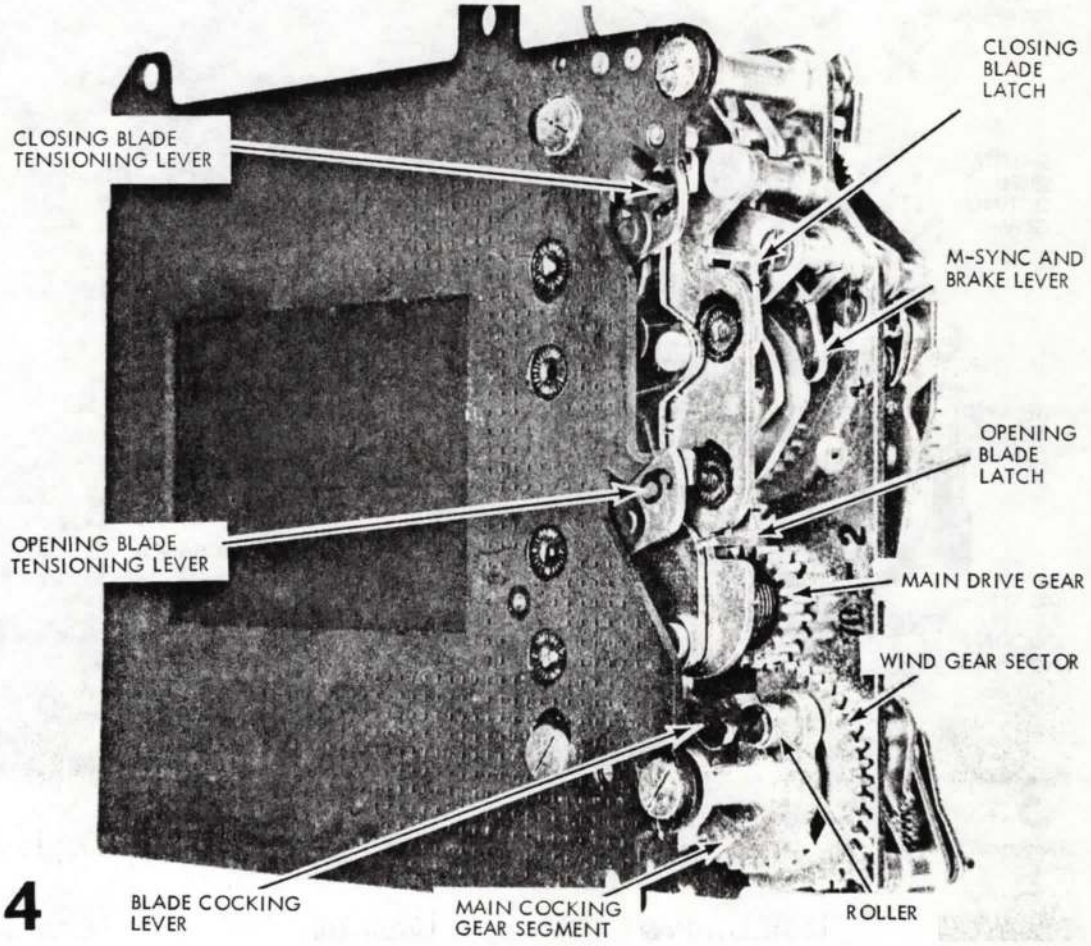
1 CAMERA USING THE COPAL SQUARE S SHUTTER



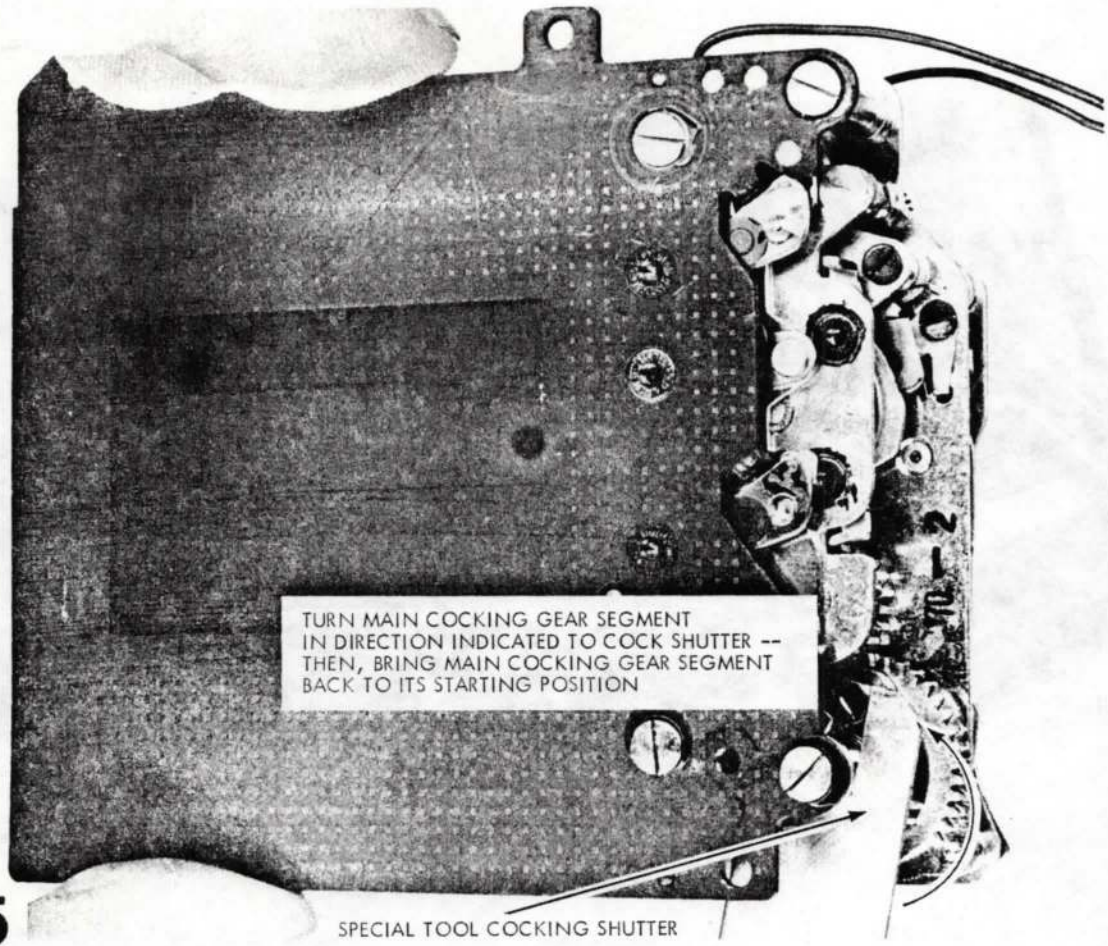
2 INSIDE OF CAMERA FRONT PLATE ASSEMBLY


SPEEDS ESCAPEMENT
SHUTTER SPEED SETTING GEAR
DELAYED-ACTION DRIVE SPRING
DELAYED-ACTION COCKING ARM
RELEASE PAWL
(ENGAGED BY MIRROR LIFTING MECHANISM TO RELEASE SHUTTER)
DELAYED-ACTION ESCAPEMENT

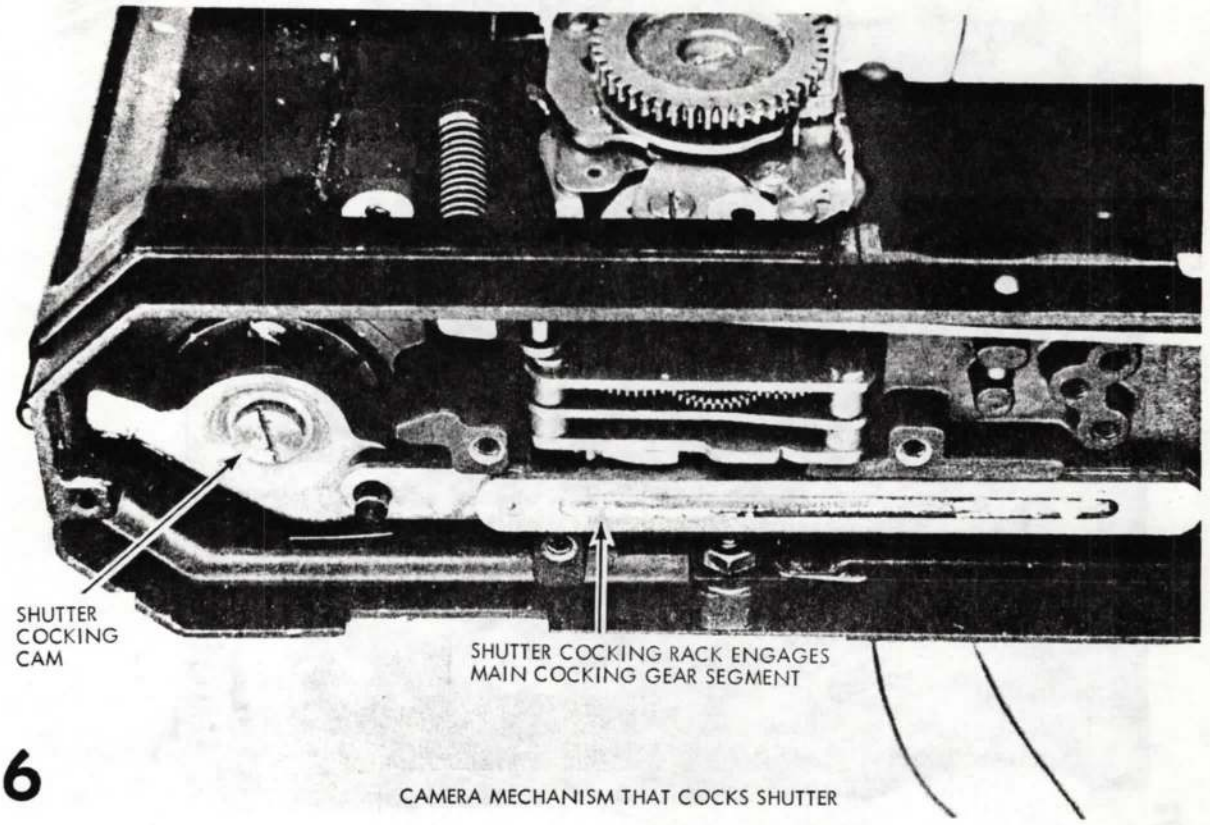
3


CLOSING BLADE LATCH
CLOSING BLADE TENSIONING LEVER
M-SYNC AND BRAKE LEVER
OPENING BLADE LATCH
OPENING BLADE TENSIONING LEVER
MAIN DRIVE GEAR
WIND GEAR SECTOR
BLADE COCKING LEVER
MAIN COCKING GEAR SEGMENT
ROLLER

4

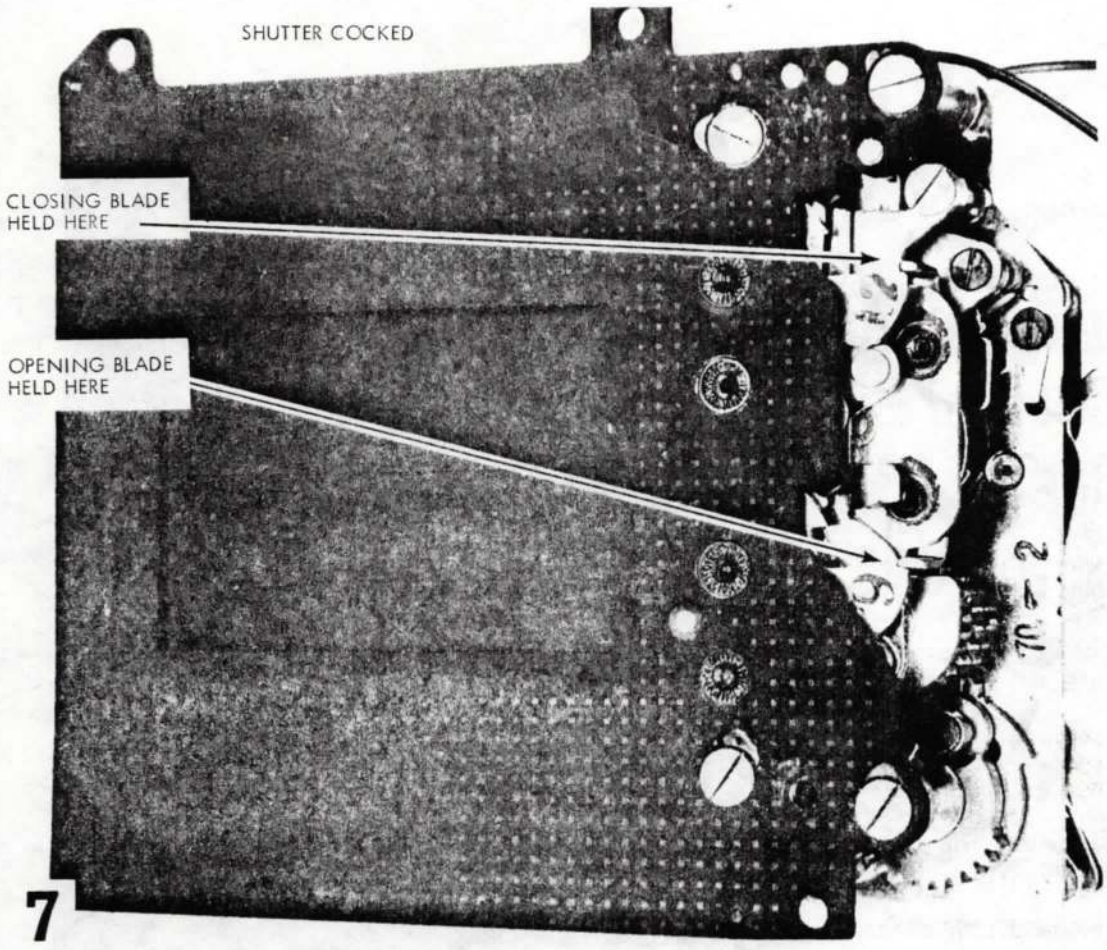

TURN MAIN COCKING GEAR SEGMENT
IN DIRECTION INDICATED TO COCK SHUTTER --
THEN, BRING MAIN COCKING GEAR SEGMENT
BACK TO ITS STARTING POSITION

5 SPECIAL TOOL COCKING SHUTTER

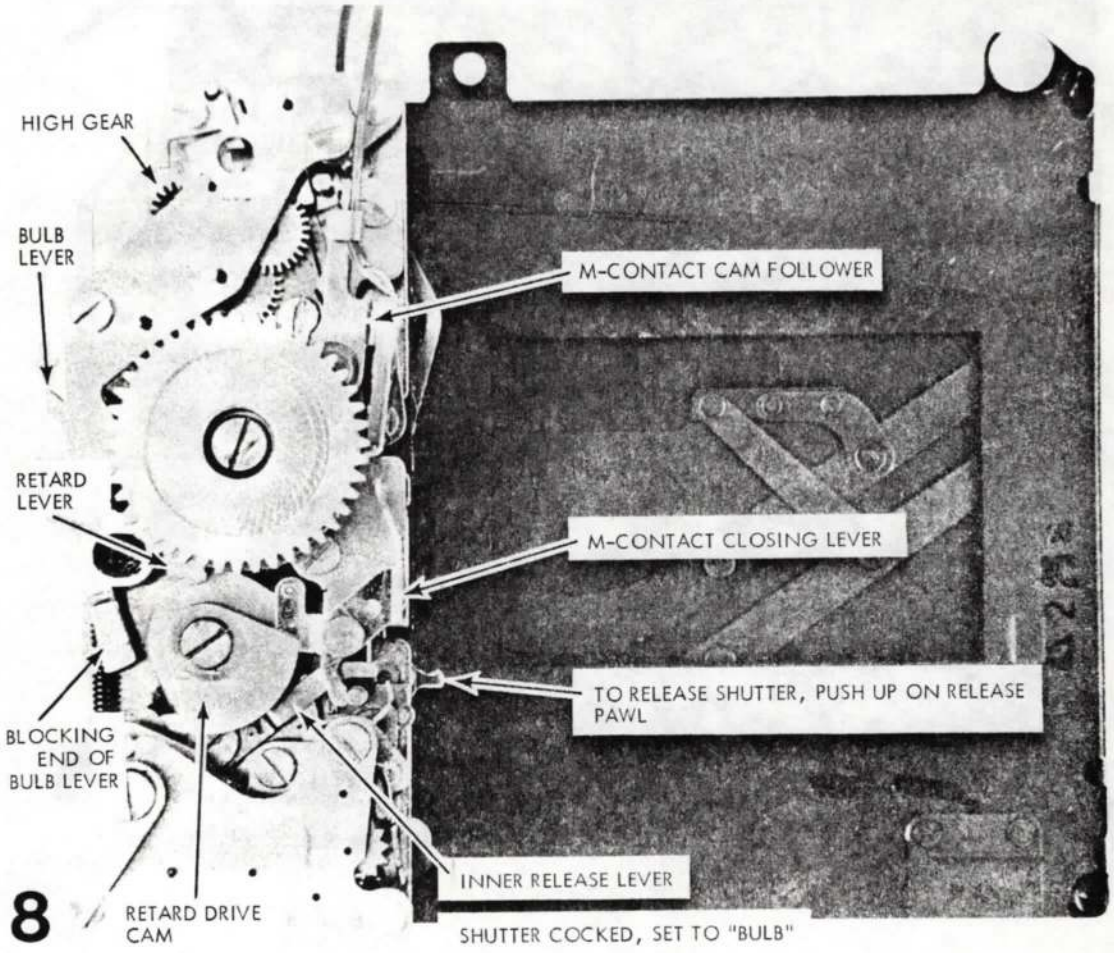


6

CAMERA MECHANISM THAT COCKS SHUTTER

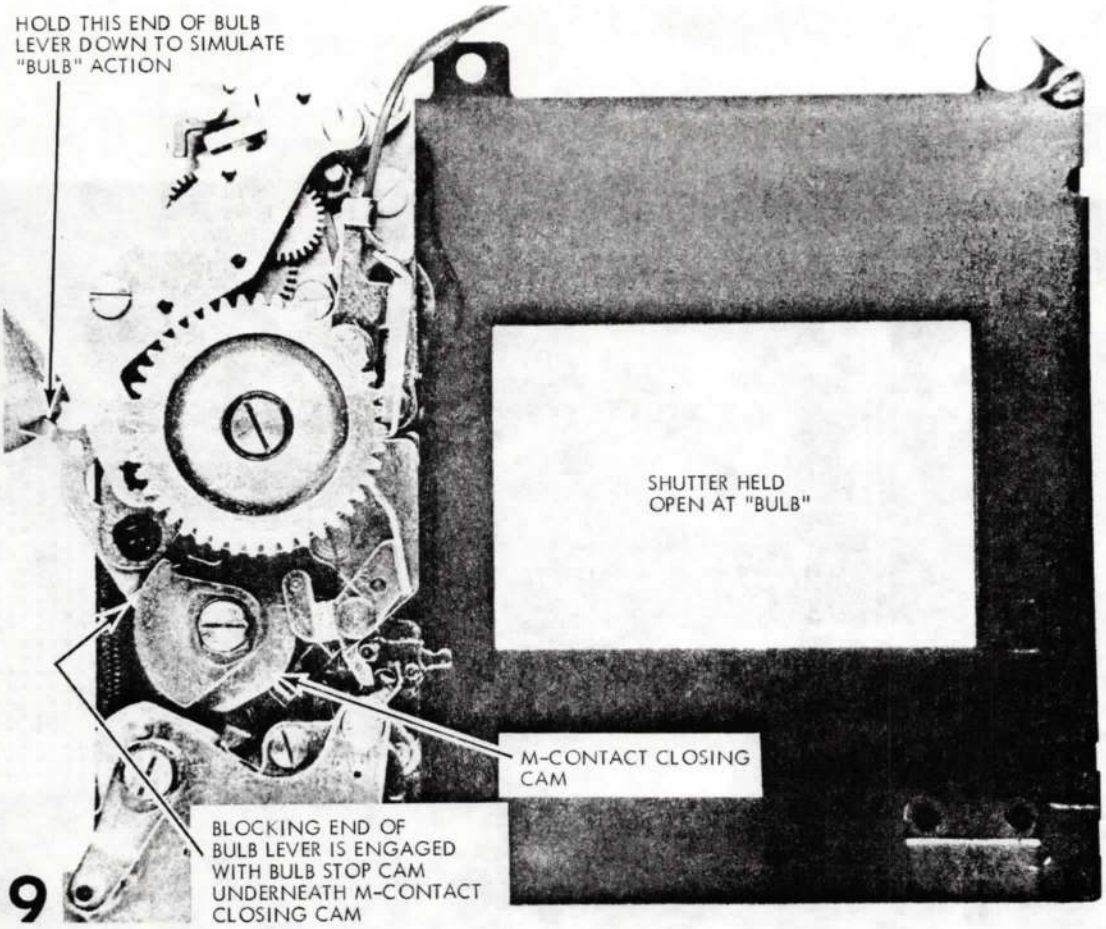

SHUTTER COCKED
CLOSING BLADE HELD HERE
OPENING BLADE HELD HERE

7



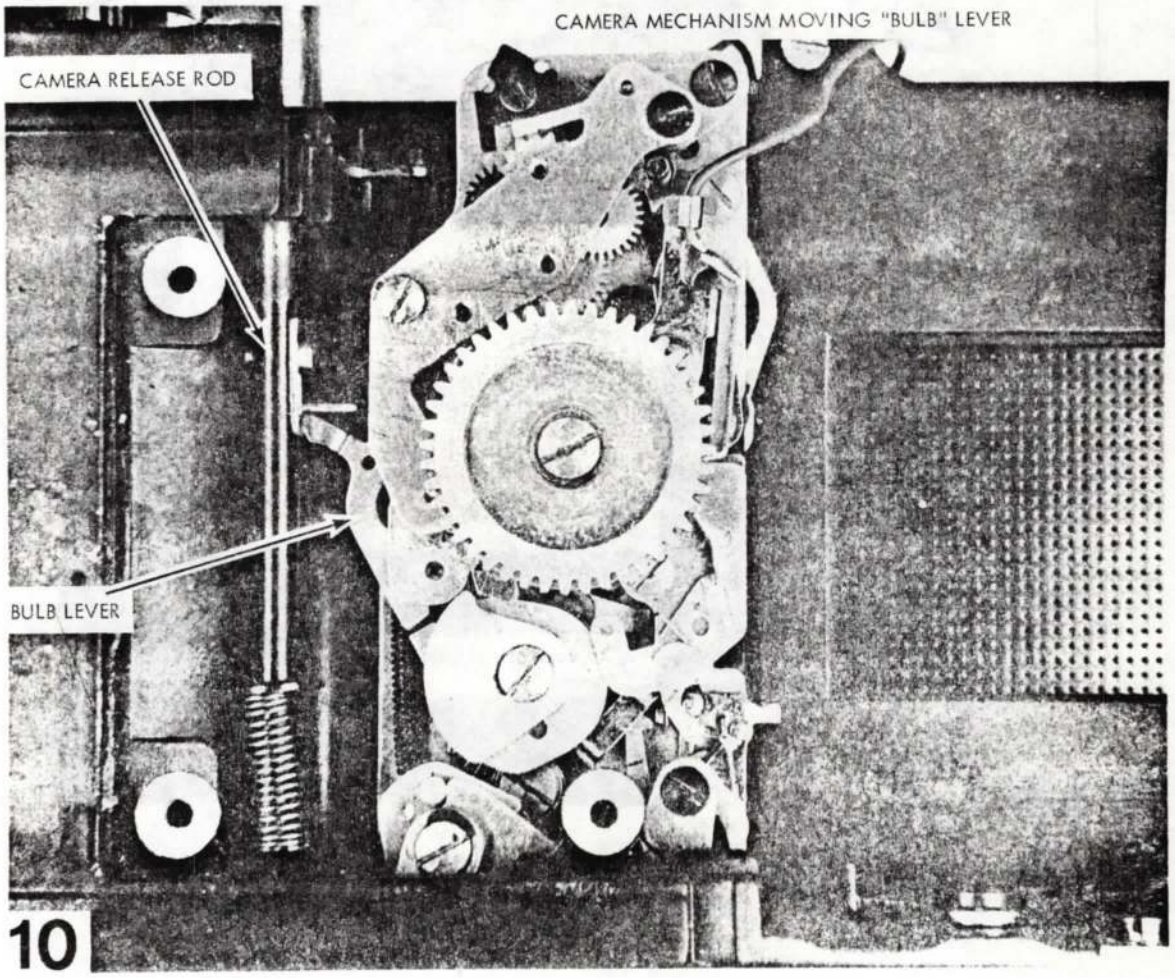
8

SHUTTER COCKED, SET TO "BULB"


HOLD THIS END OF BULB LEVER DOWN TO SIMULATE "BULB" ACTION
SHUTTER HELD OPEN AT "BULB"
M-CONTACT CLOSING CAM
BLOCKING END OF BULB LEVER IS ENGAGED WITH BULB STOP CAM UNDERNEATH M-CONTACT CLOSING CAM

9

CAMERA MECHANISM MOVING "BULB" LEVER

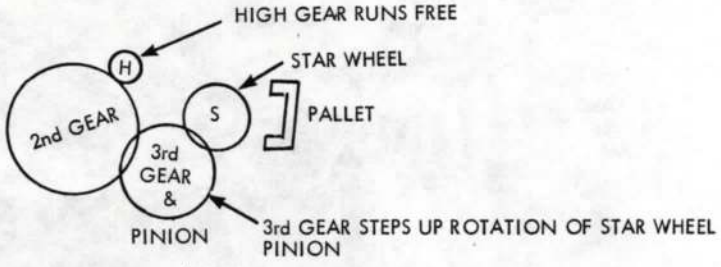


10

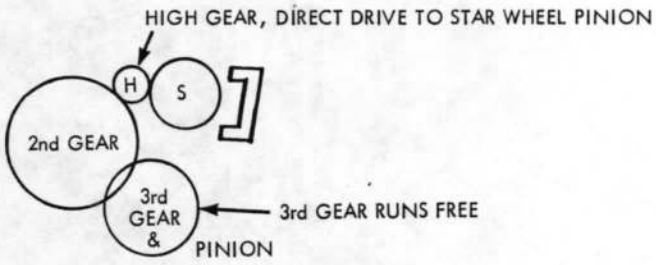
SHUTTER SPEED CYCLE

VARYING AMOUNTS OF RETARD STROKE AT
I SECOND THROUGH 1/125 SECOND -- NO
RETARD AT 1/250 SECOND THROUGH 1/1000 SECOND.

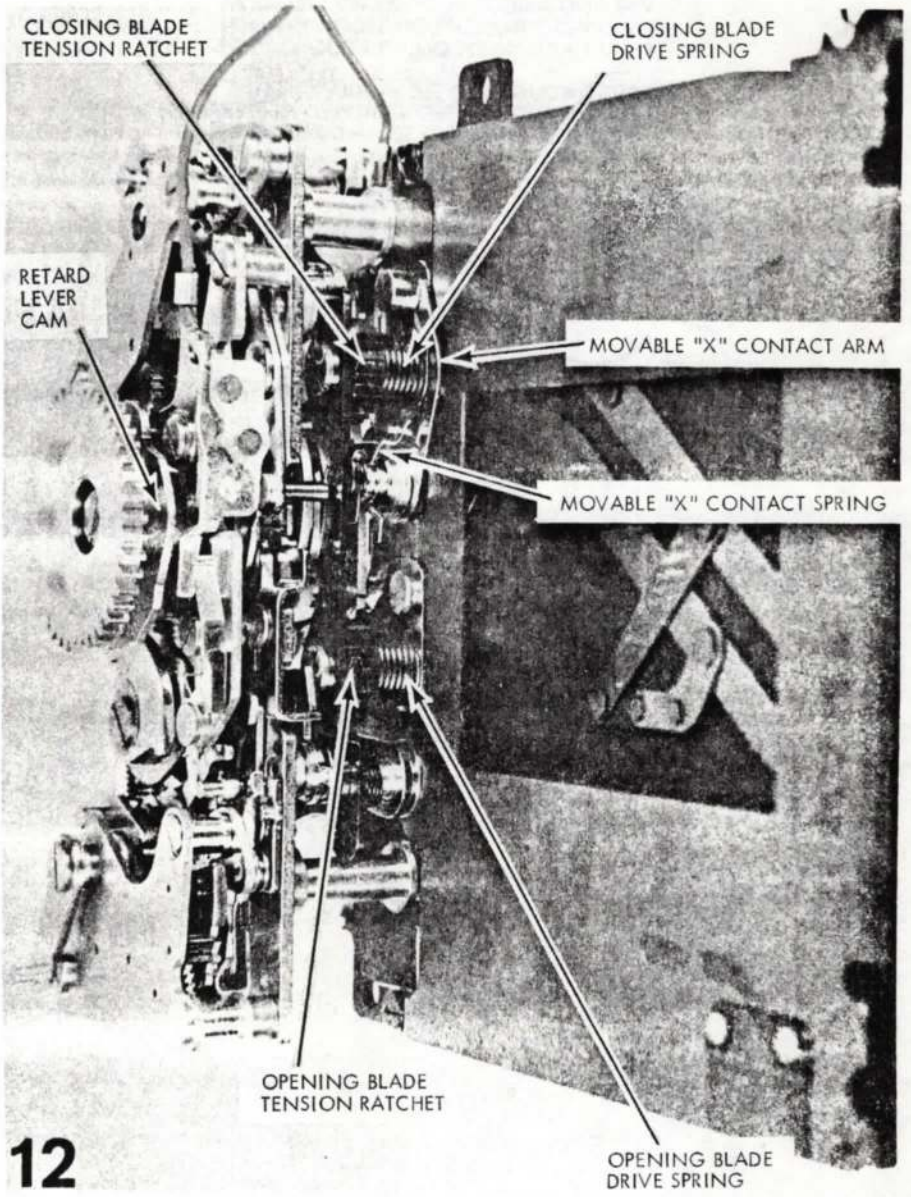
I SEC THROUGH 1/30 SEC -- FULL PALLET
I SEC THROUGH 1/4 SEC --STEPPED-UP GEARING
1/8 SEC THROUGH 1/125 SEC -- DIRECT GEARING



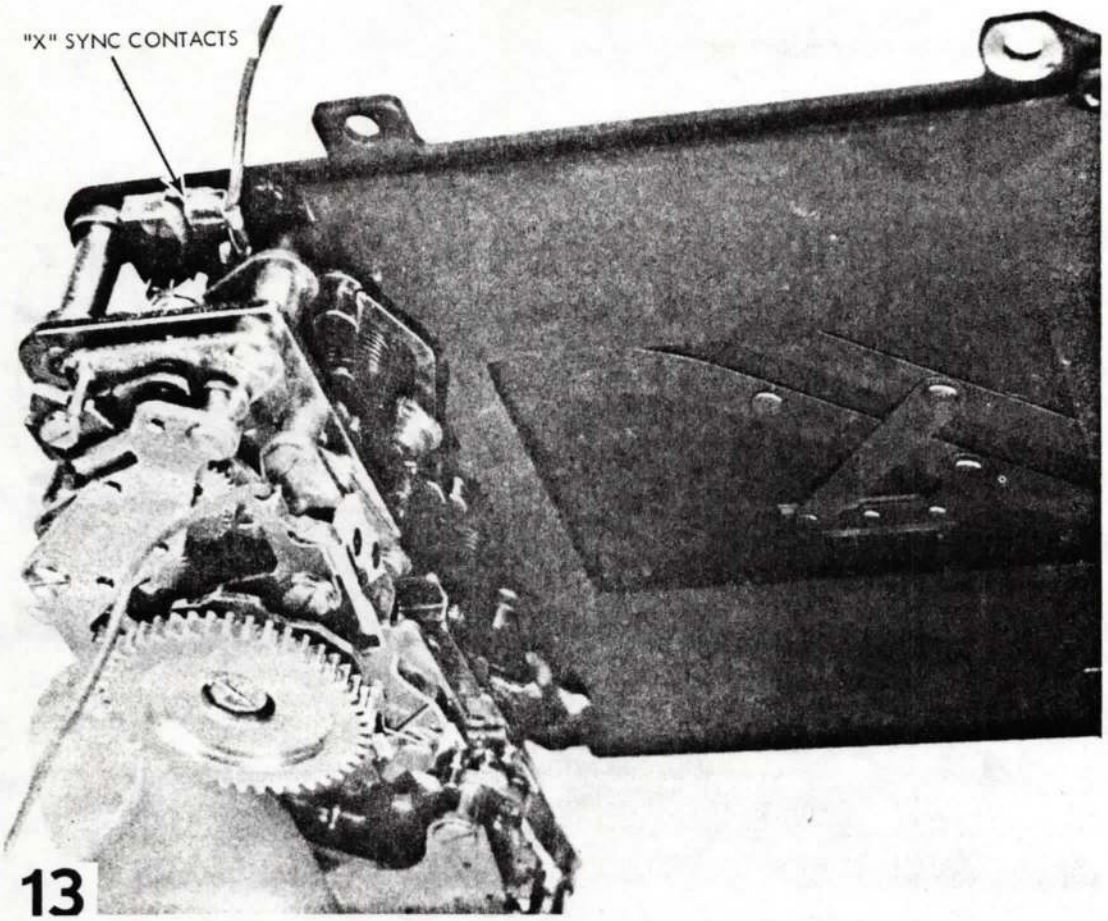
LOW I SEC - 1/4 SEC



HIGH 1/8 SEC - 1/125 SEC

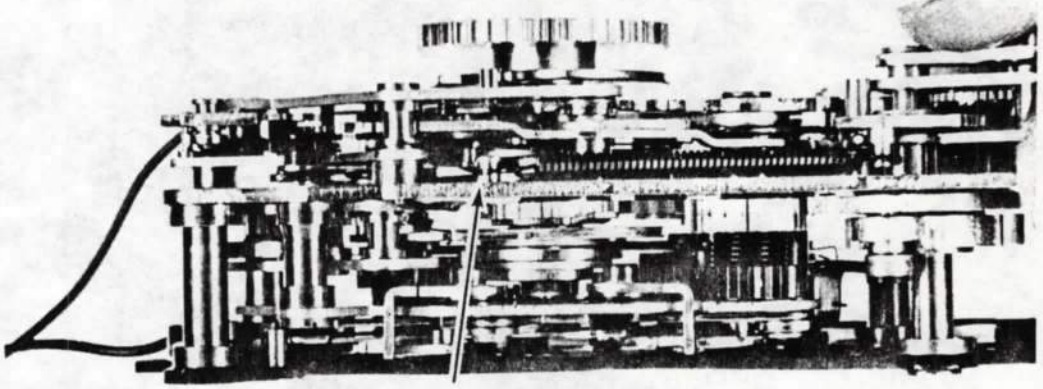

CLOSING BLADE
TENSION RATCHET
CLOSING BLADE
DRIVE SPRING
RETARD
LEVER
CAM
MOVABLE "X" CONTACT ARM
MOVABLE "X" CONTACT SPRING
OPENING BLADE
TENSION RATCHET
OPENING BLADE
DRIVE SPRING

12



13

TO REMOVE DELAYED-ACTION ESCAPEMENT:



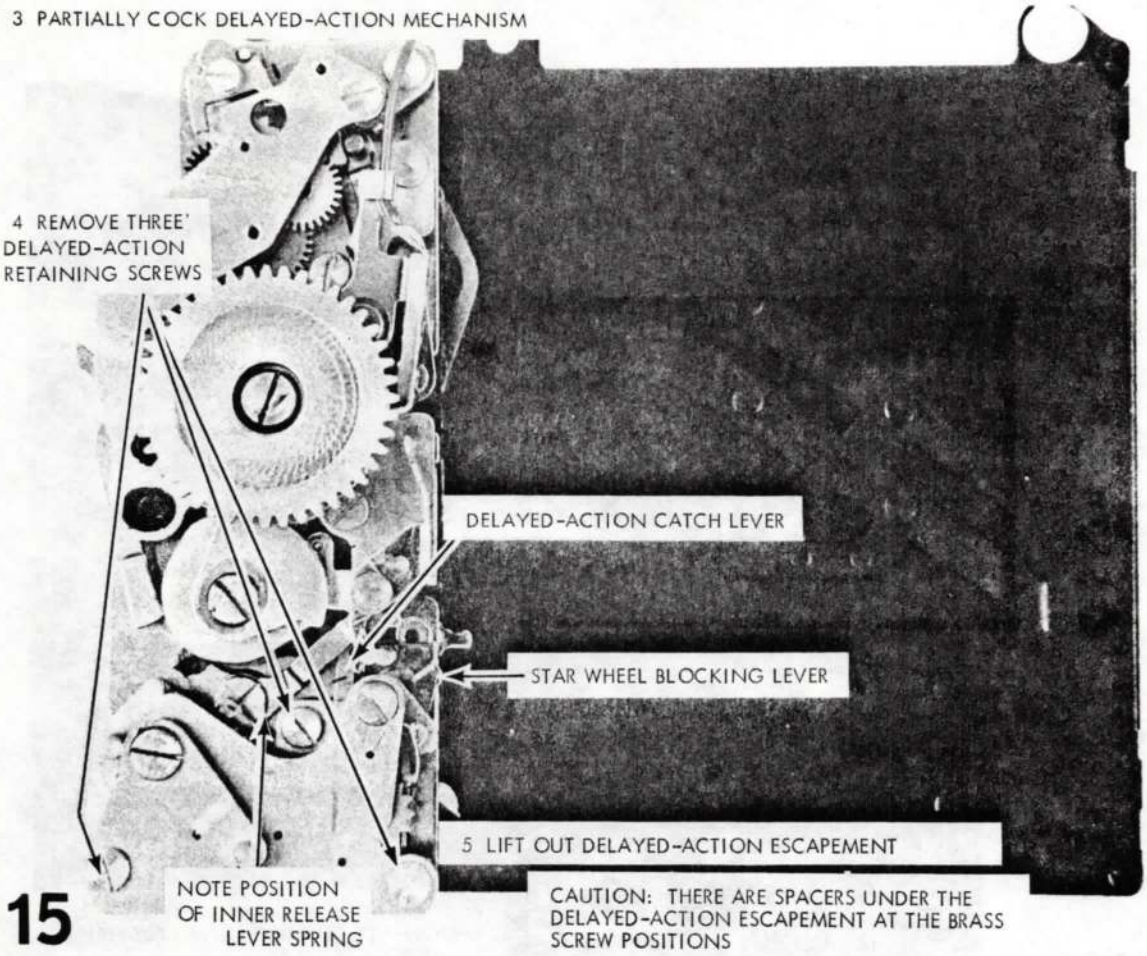
1 DISCONNECT END OF DELAYED-ACTION DRIVE DRIVE SPRING FROM POST ON MECHANISM PLATE

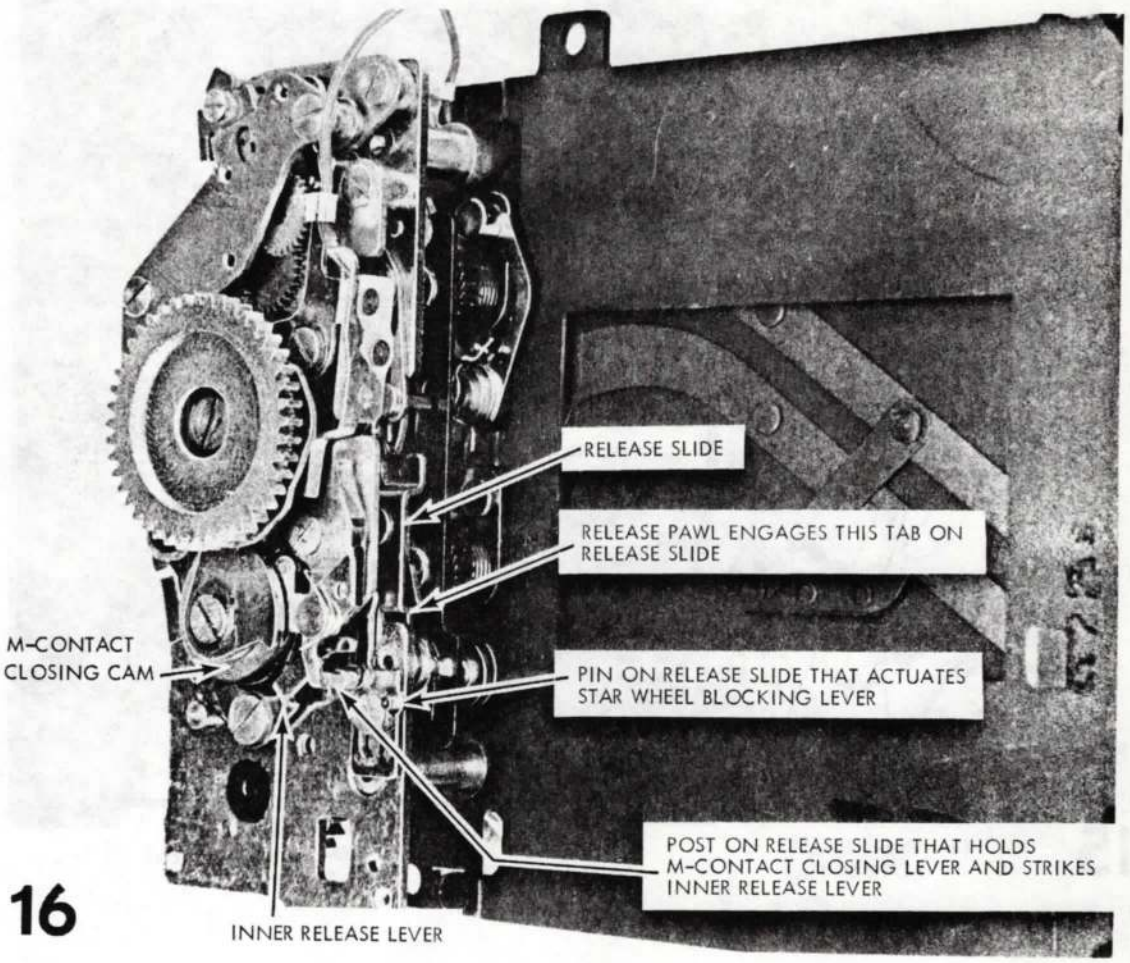
2 REMOVE DELAYED-ACTION DRIVE SPRING

(con't figure 15)

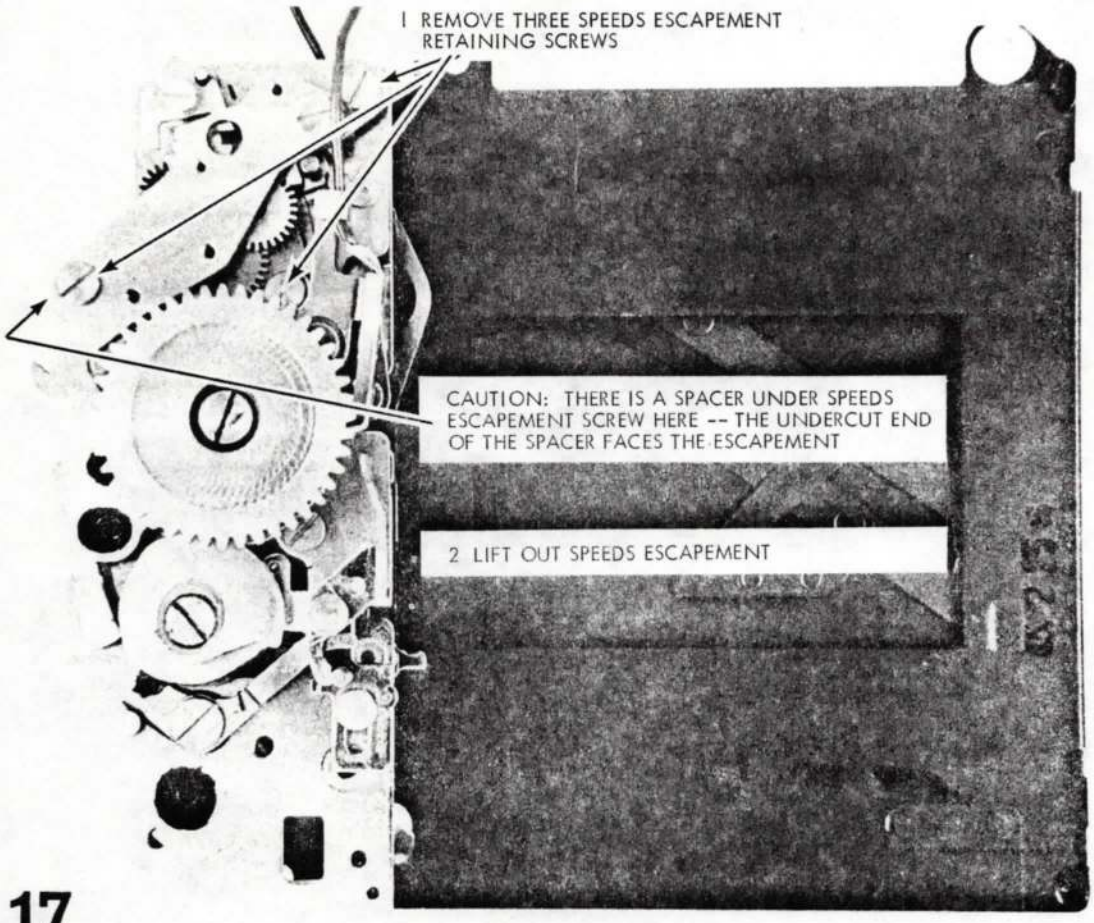
14

3 PARTIALLY COCK DELAYED-ACTION MECHANISM


4 REMOVE THREE DELAYED-ACTION RETAINING SCREWS
DELAYED-ACTION CATCH LEVER
STAR WHEEL BLOCKING LEVER
5 LIFT OUT DELAYED-ACTION ESCAPEMENT
NOTE POSITION OF INNER RELEASE LEVER SPRING
CAUTION: THERE ARE SPACERS UNDER THE DELAYED-ACTION ESCAPEMENT AT THE BRASS SCREW POSITIONS

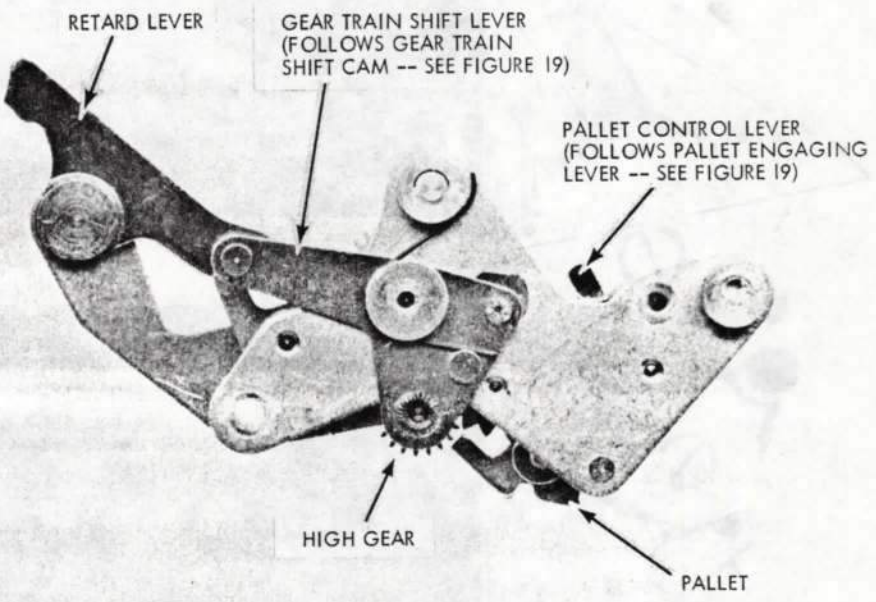

RELEASE SLIDE
RELEASE PAWL ENGAGES THIS TAB ON RELEASE SLIDE
M-CONTACT CLOSING CAM
PIN ON RELEASE SLIDE THAT ACTUATES STAR WHEEL BLOCKING LEVER
POST ON RELEASE SLIDE THAT HOLDS M-CONTACT CLOSING LEVER AND STRIKES INNER RELEASE LEVER
INNER RELEASE LEVER

16

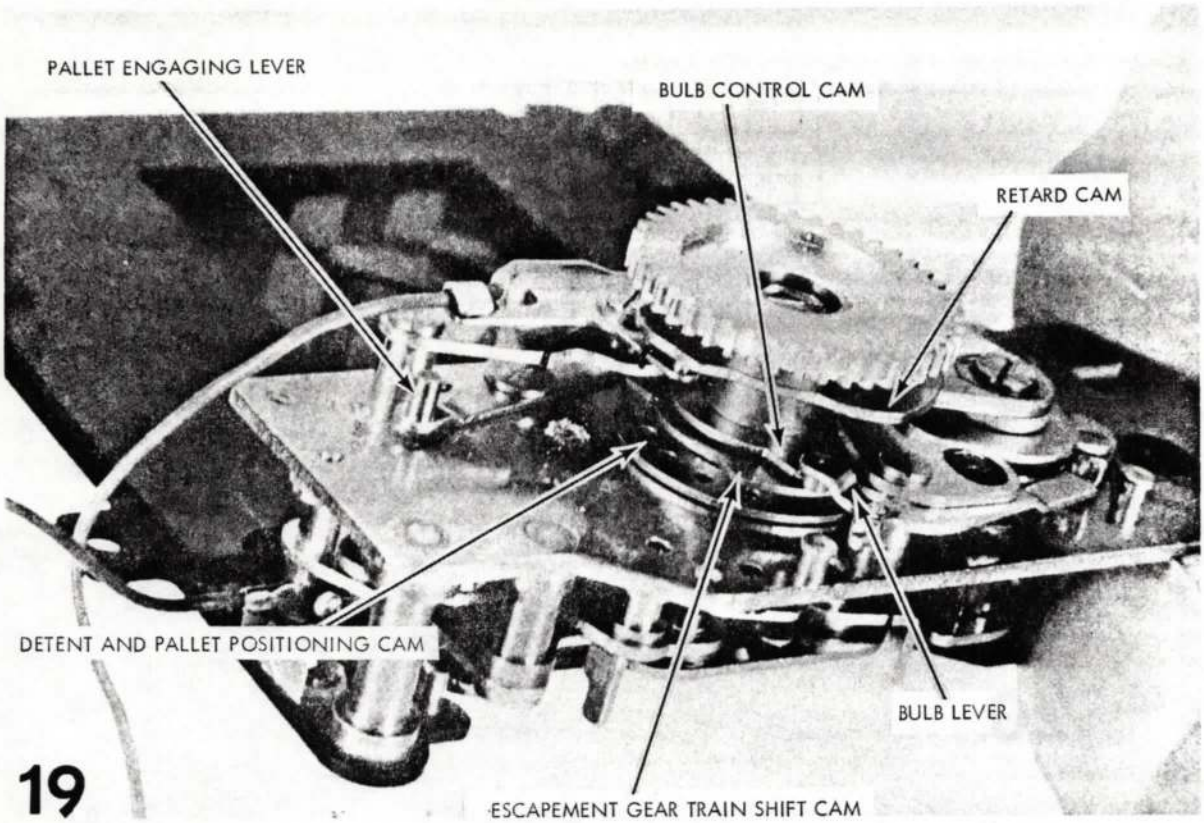

1 REMOVE THREE SPEEDS ESCAPEMENT RETAINING SCREWS
CAUTION: THERE IS A SPACER UNDER SPEEDS ESCAPEMENT SCREW HERE -- THE UNDERCUT END OF THE SPACER FACES THE ESCAPEMENT
2 LIFT OUT SPEEDS ESCAPEMENT

17

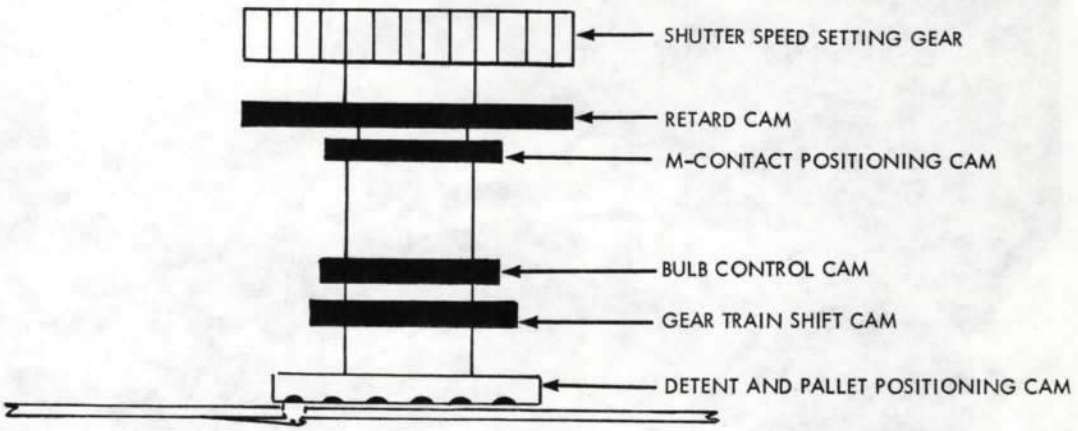
UNDERSIDE OF SPEEDS ESCAPEMENT



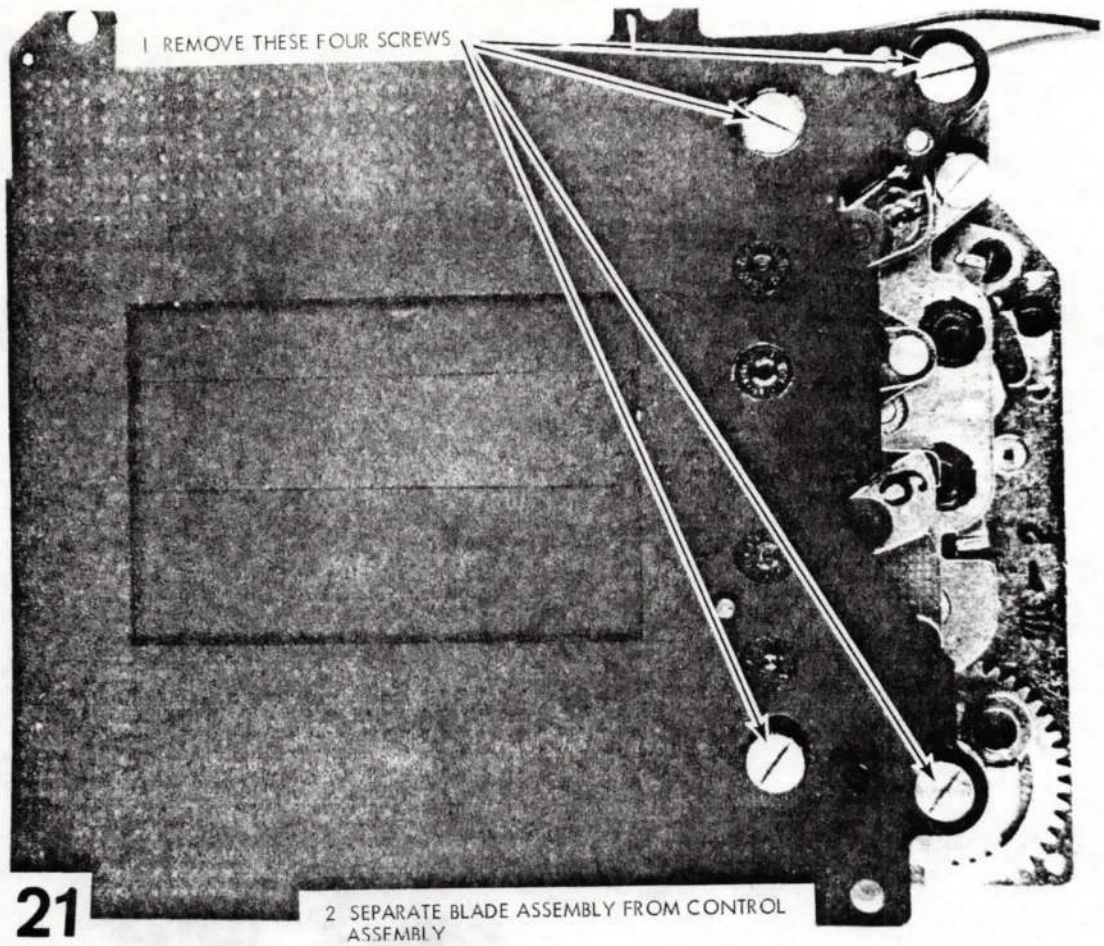
18

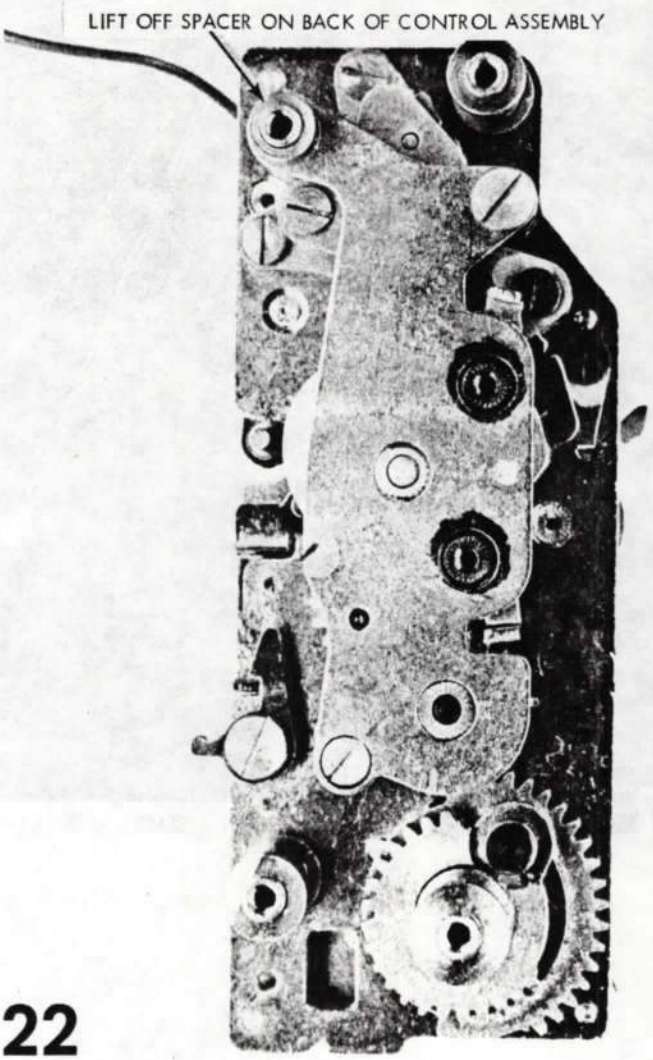

PALLET ENGAGING LEVER
BULB CONTROL CAM
RETARD CAM
DETENT AND PALLET POSITIONING CAM
BULB LEVER
ESCAPEMENT GEAR TRAIN SHIFT CAM

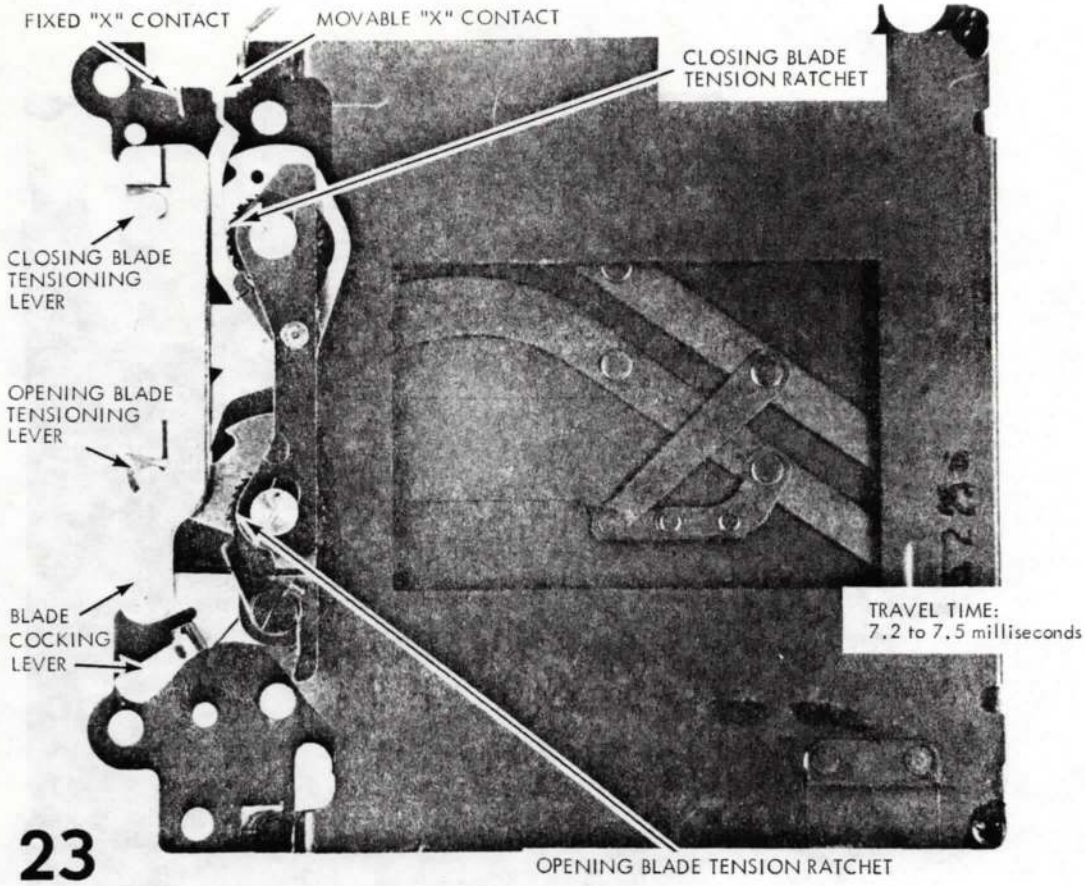
19



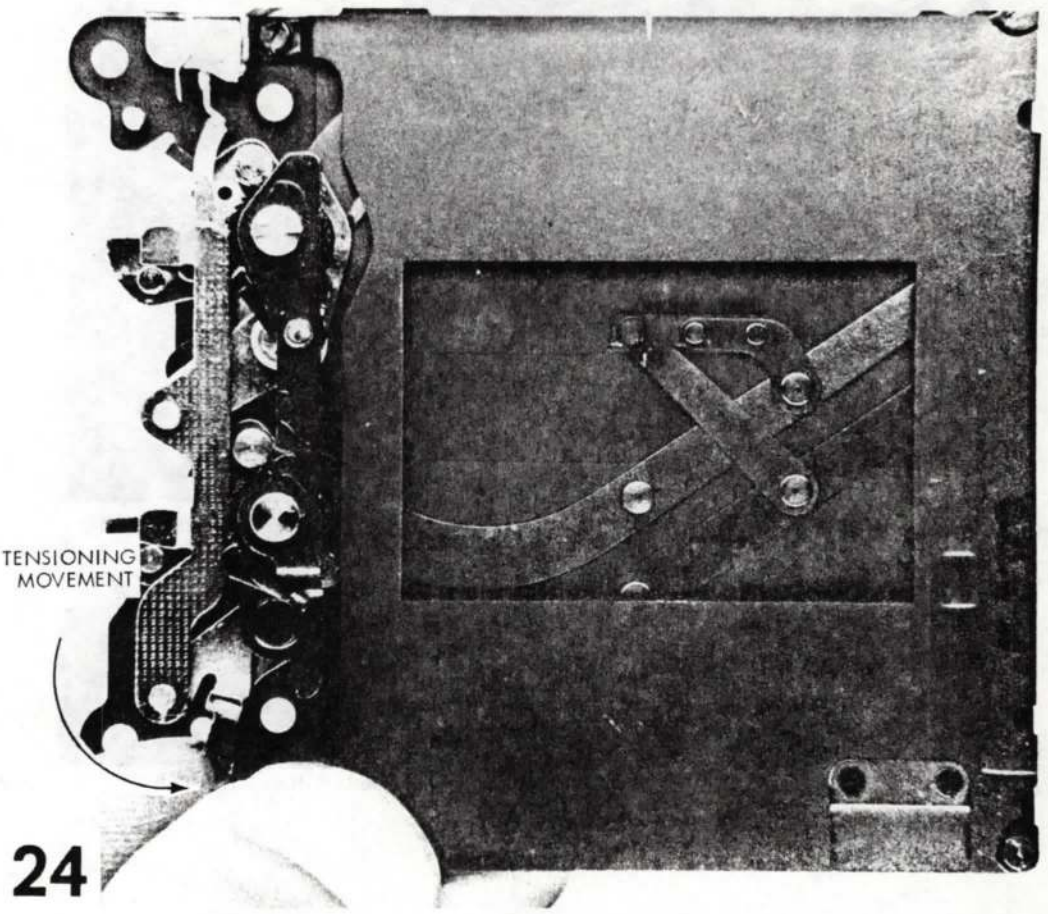
GRAPHIC SKETCH OF SPEED CONTROL CAM STACK


1 REMOVE THESE FOUR SCREWS
2 SEPARATE BLADE ASSEMBLY FROM CONTROL ASSEMBLY

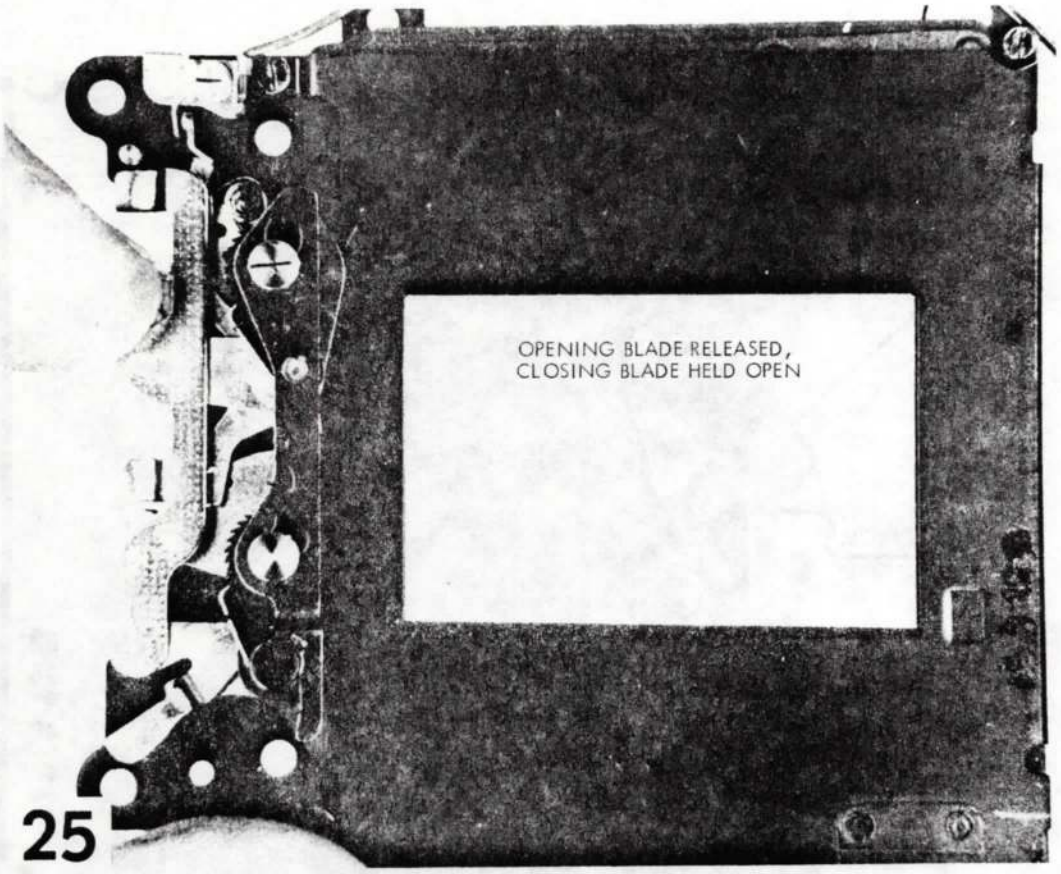

LIFT OFF SPACER ON BACK OF CONTROL ASSEMBLY


FIXED "X" CONTACT
MOVABLE "X" CONTACT
CLOSING BLADE TENSION RATCHET
CLOSING BLADE TENSIONING LEVER
OPENING BLADE TENSIONING LEVER
BLADE COCKING LEVER
TRAVEL TIME: 7.2 to 7.5 milliseconds
OPENING BLADE TENSION RATCHET

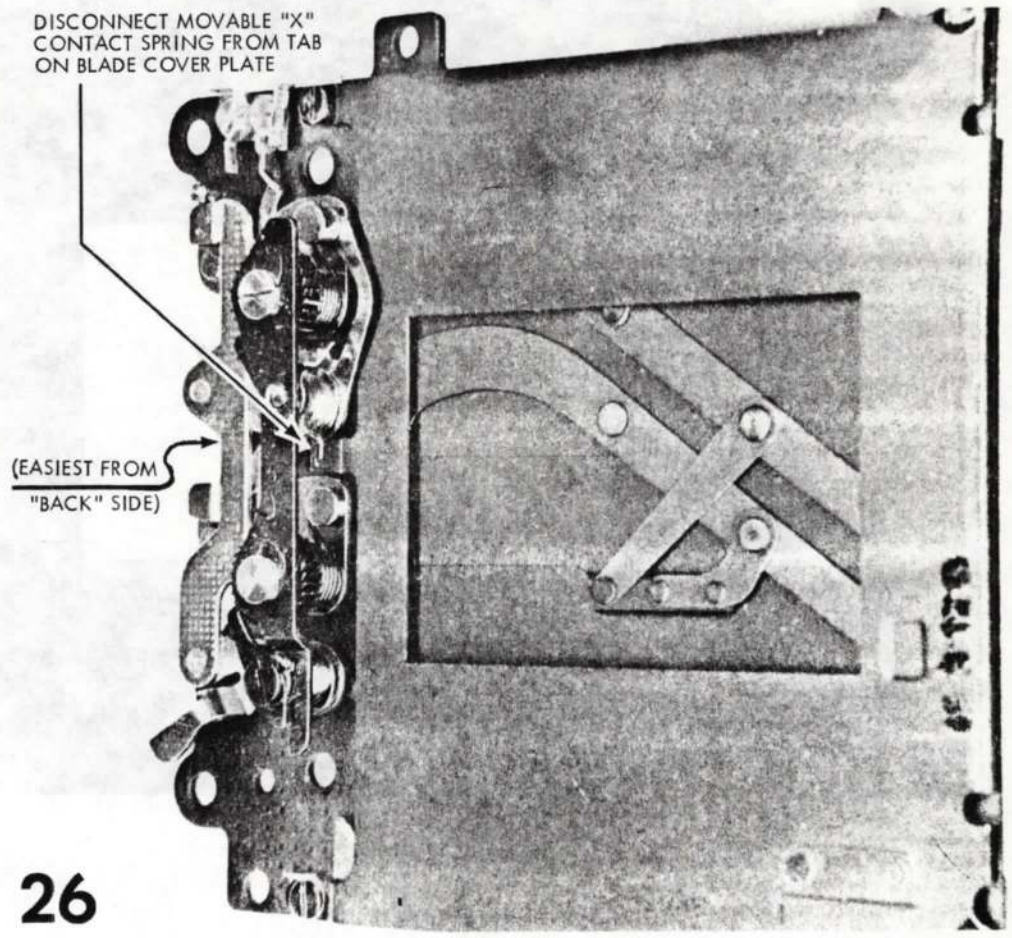
23



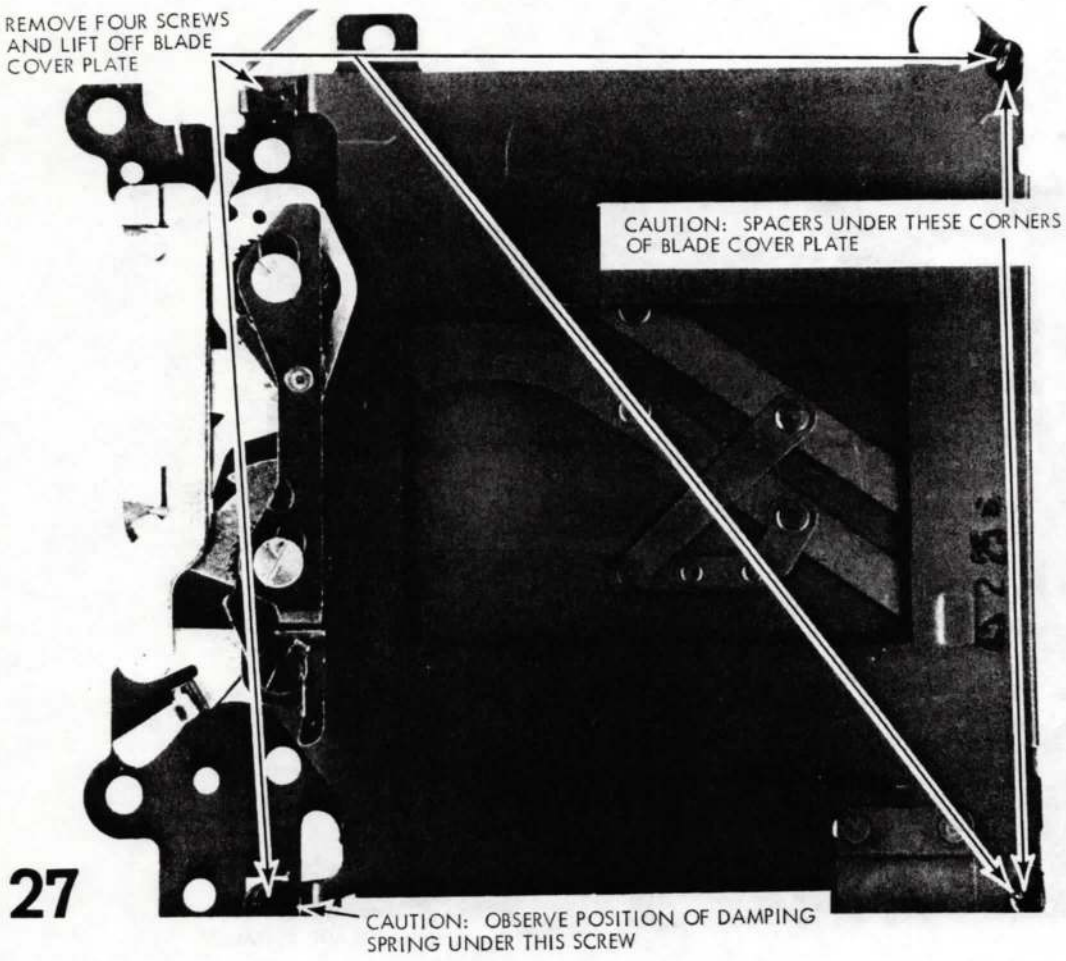
24



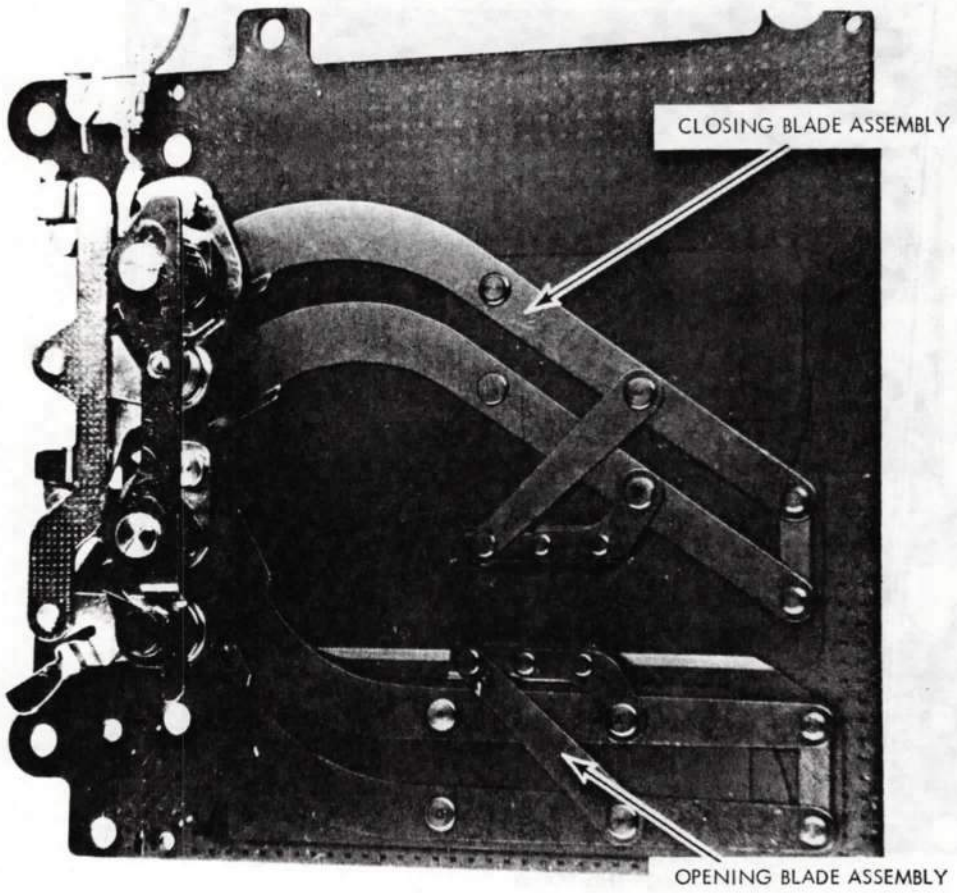
25


DISCONNECT MOVABLE "X" CONTACT SPRING FROM TAB ON BLADE COVER PLATE
(EASIEST FROM "BACK" SIDE)

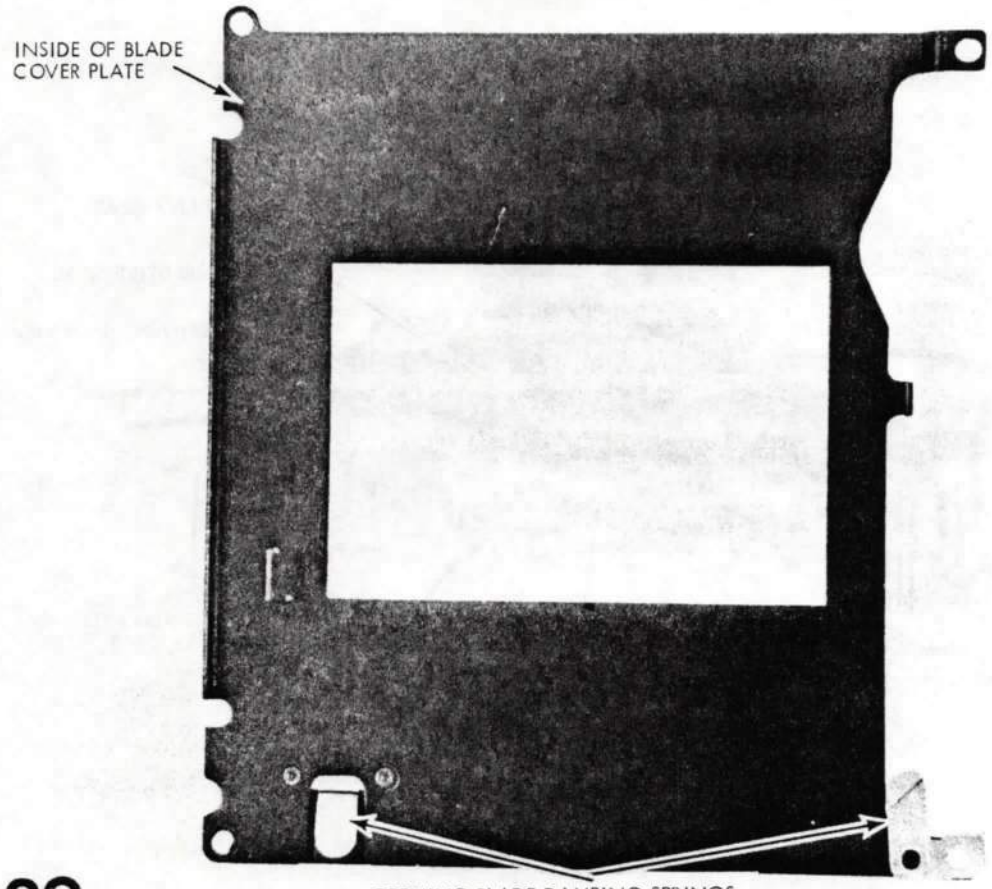
26


REMOVE FOUR SCREWS AND LIFT OFF BLADE COVER PLATE
CAUTION: SPACERS UNDER THESE CORNERS OF BLADE COVER PLATE
CAUTION: OBSERVE POSITION OF DAMPING SPRING UNDER THIS SCREW

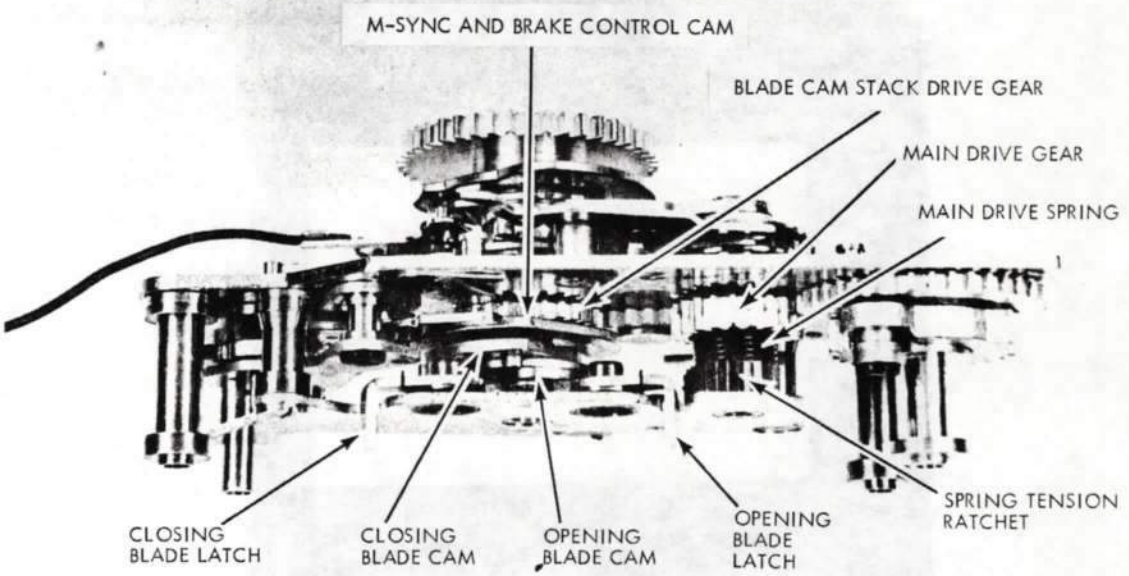
27



28

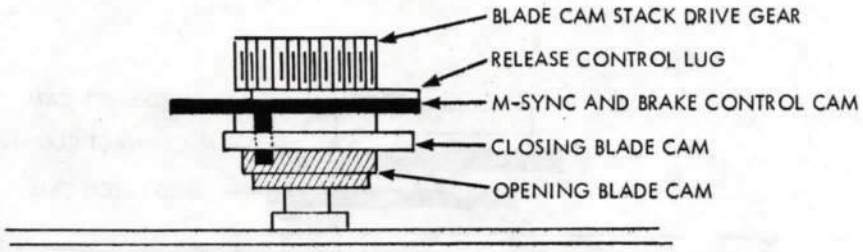


29



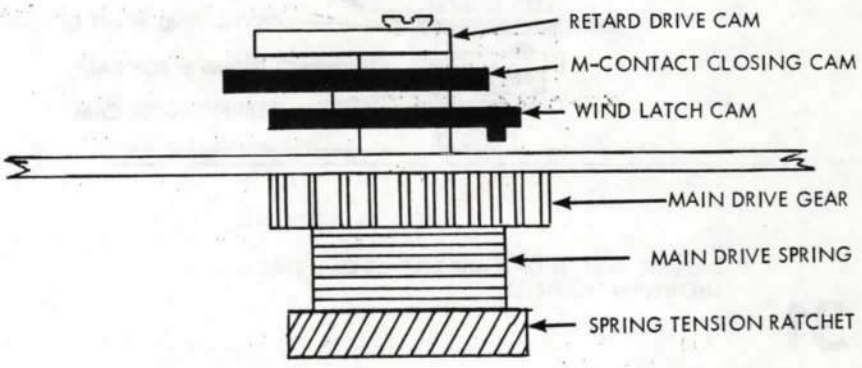
30

BLADE (RELEASE) CAM STACK

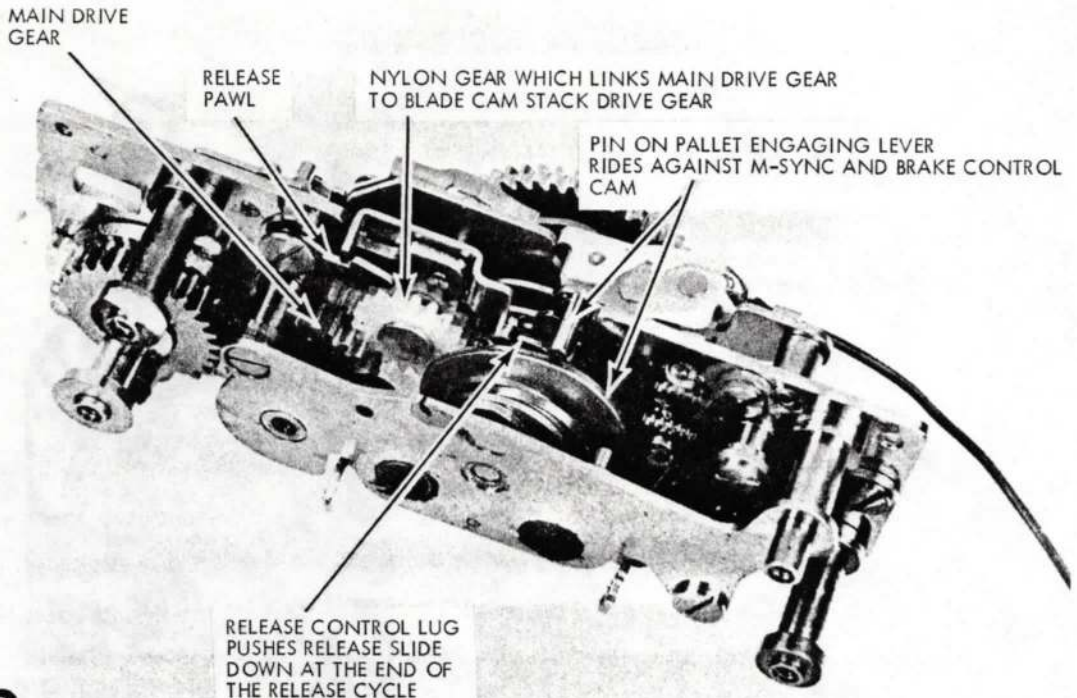


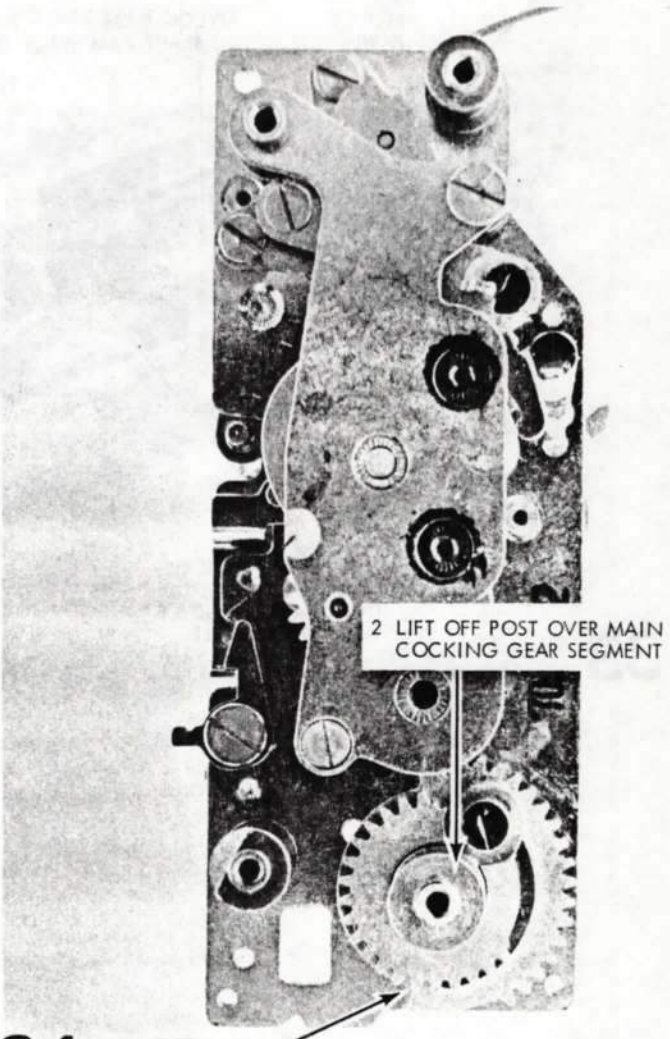
GRAPHIC SKETCH OF BLADE RELEASE CAM STACK
SHOWN IN FIGURE 30

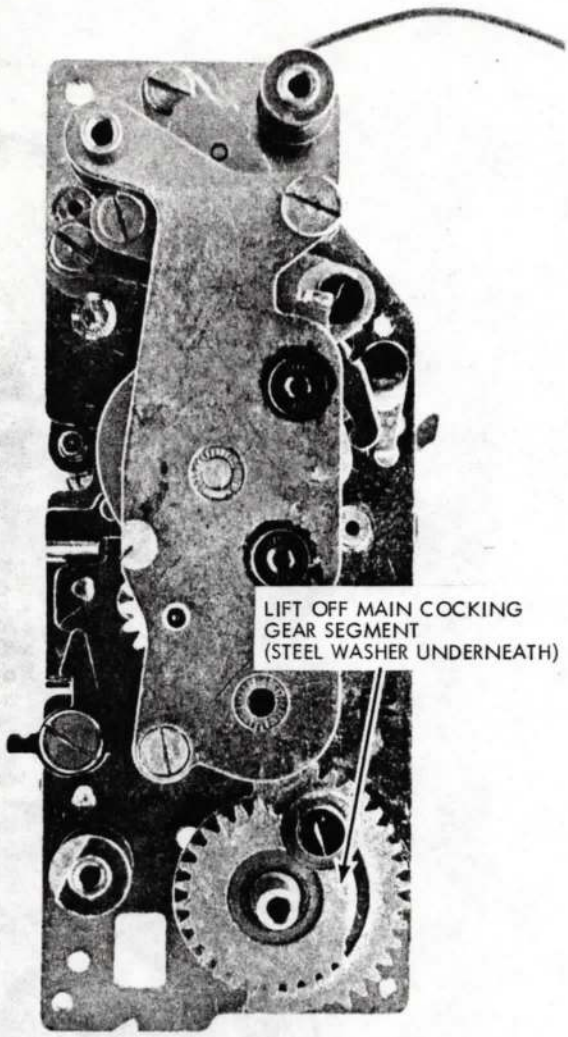
31



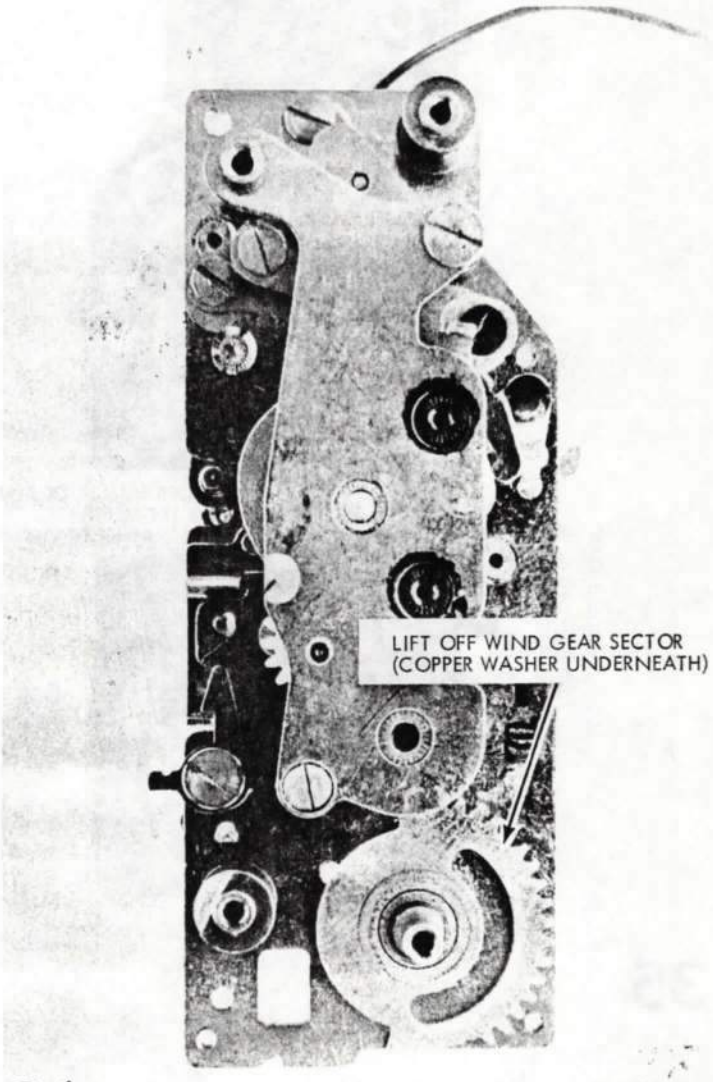
GRAPHIC SKETCH OF MAIN DRIVE CAM STACK


MAIN DRIVE GEAR
RELEASE PAWL
NYLON GEAR WHICH LINKS MAIN DRIVE GEAR TO BLADE CAM STACK DRIVE GEAR
PIN ON PALLET ENGAGING LEVER RIDES AGAINST M-SYNC AND BRAKE CONTROL CAM
RELEASE CONTROL LUG PUSHES RELEASE SLIDE DOWN AT THE END OF THE RELEASE CYCLE

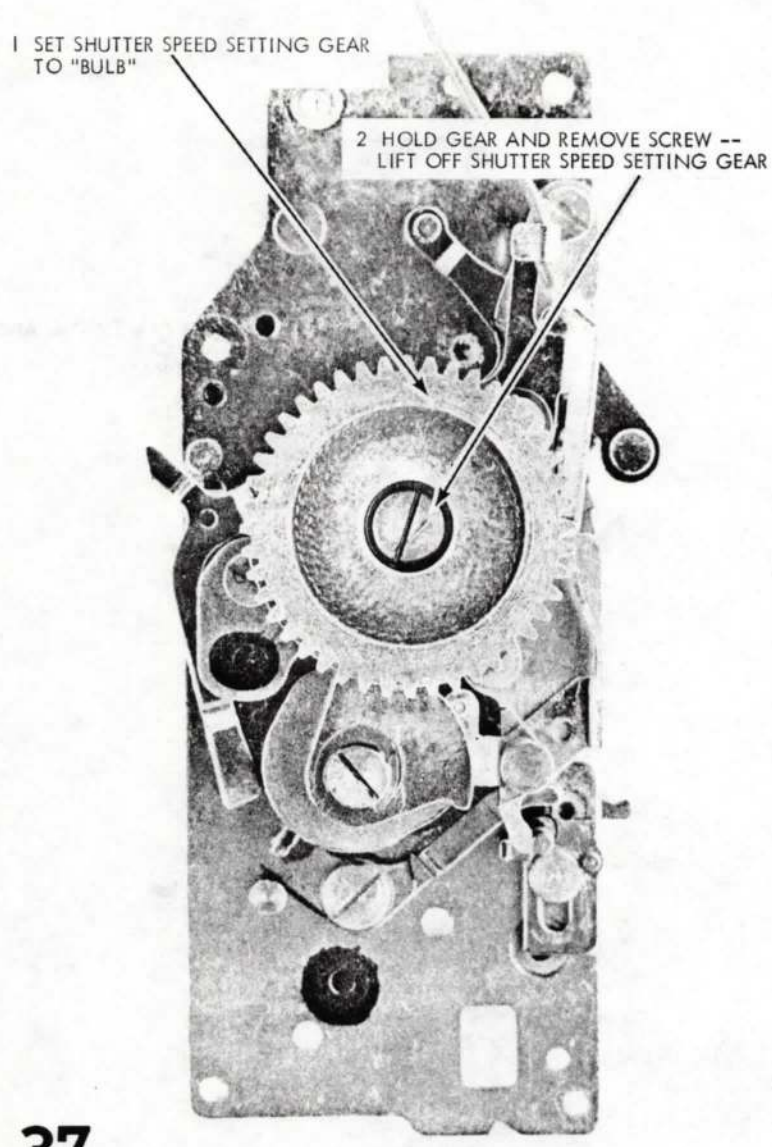

2 LIFT OFF POST OVER MAIN COCKING GEAR SEGMENT
1 SCRIBE POSITION OF WIND GEAR SECTOR IN RELEASED POSITION


LIFT OFF MAIN COCKING
GEAR SEGMENT
(STEEL WASHER UNDERNEATH)

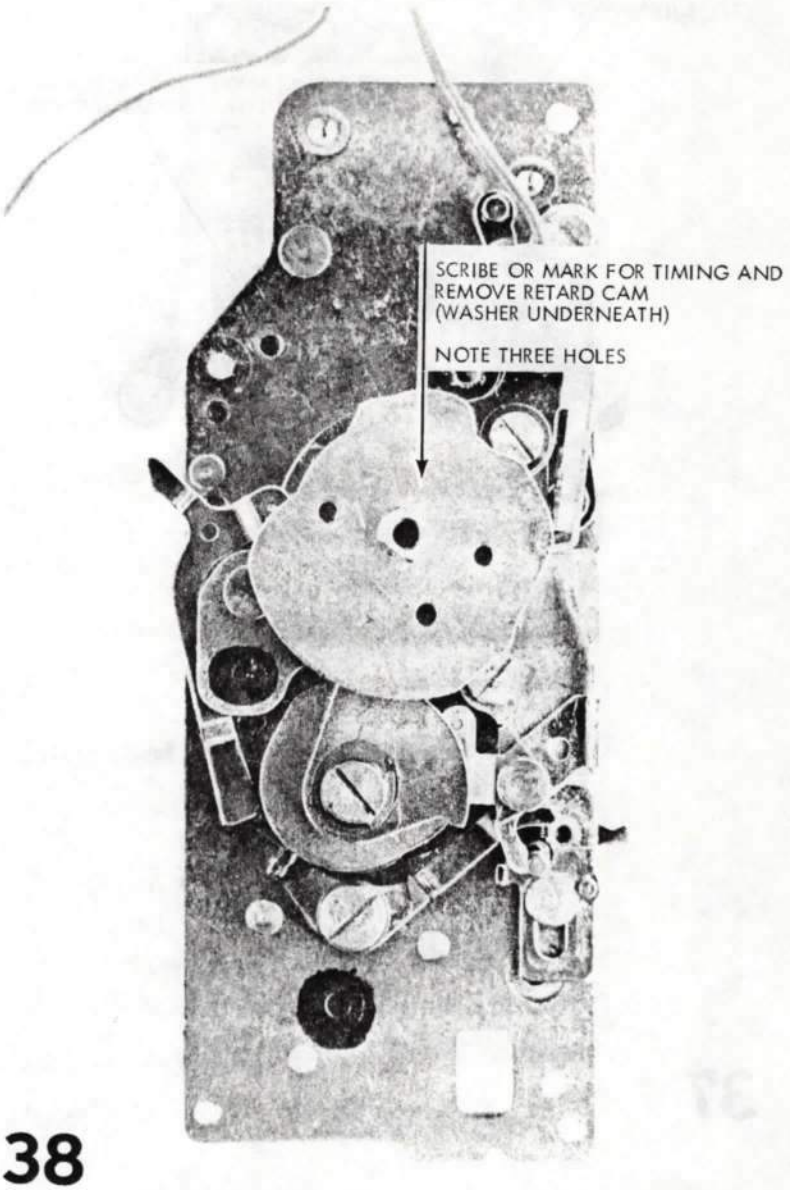
35



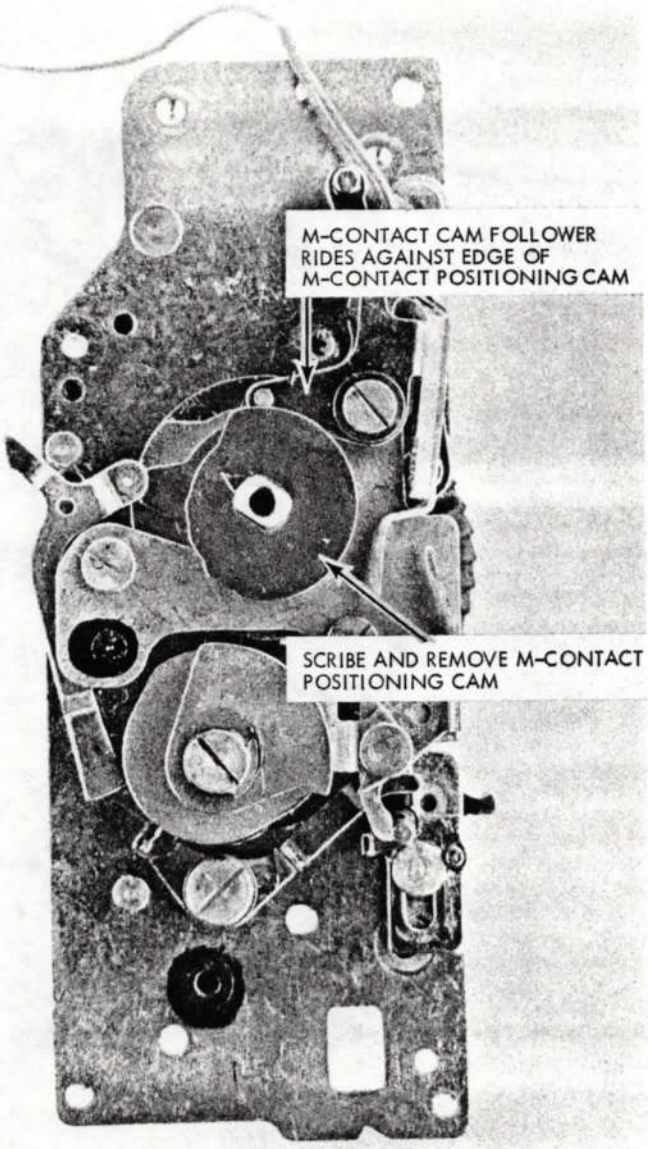
36


1 SET SHUTTER SPEED SETTING GEAR
TO "BULB"
2 HOLD GEAR AND REMOVE SCREW --
LIFT OFF SHUTTER SPEED SETTING GEAR

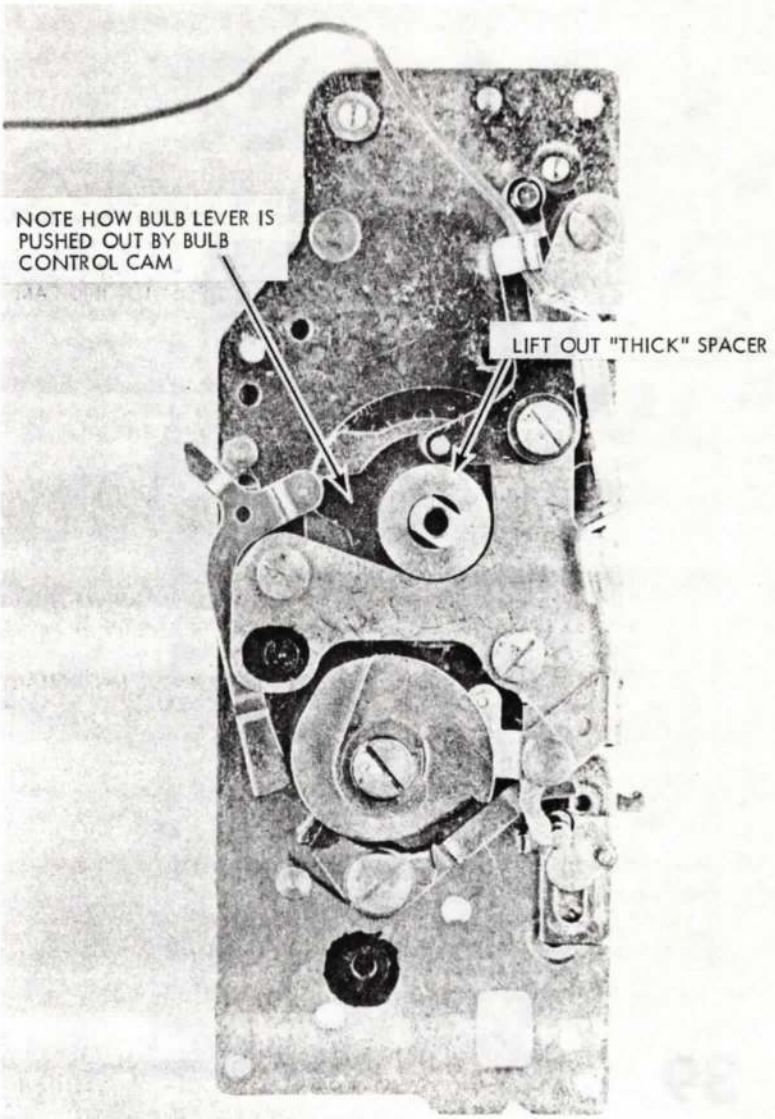
37

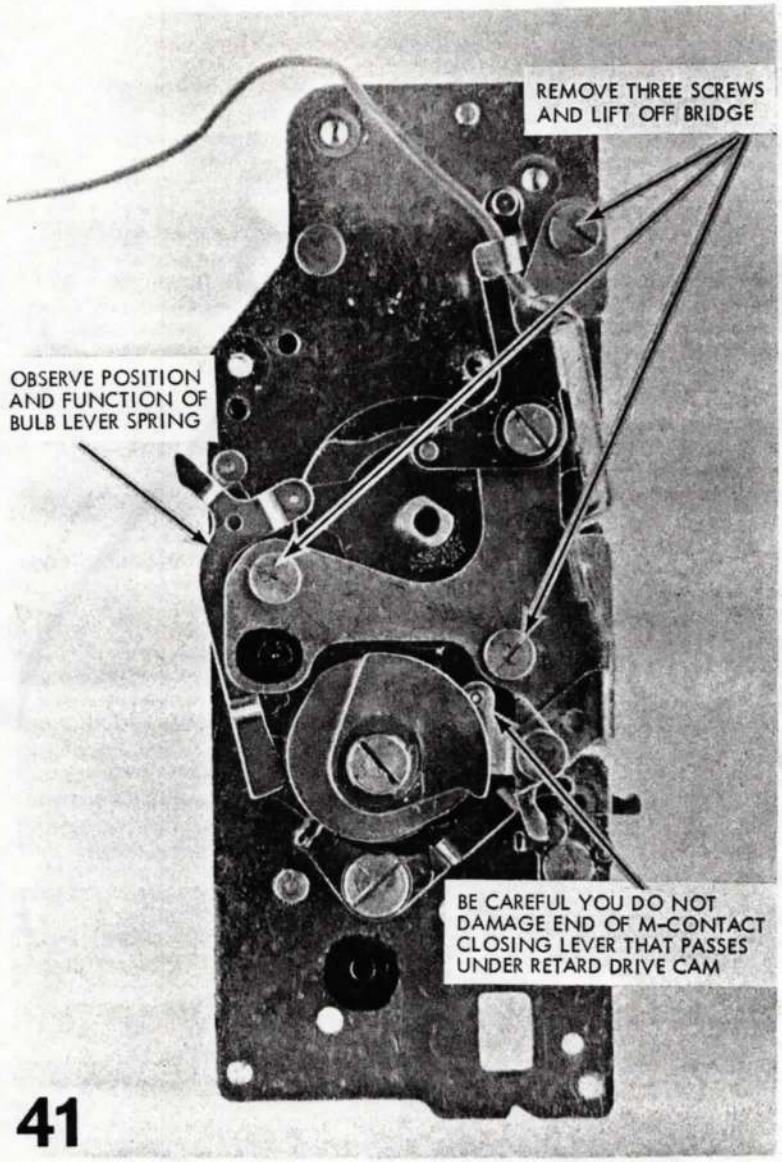

SCRIBE OR MARK FOR TIMING AND
REMOVE RETARD CAM
(WASHER UNDERNEATH)
NOTE THREE HOLES

38

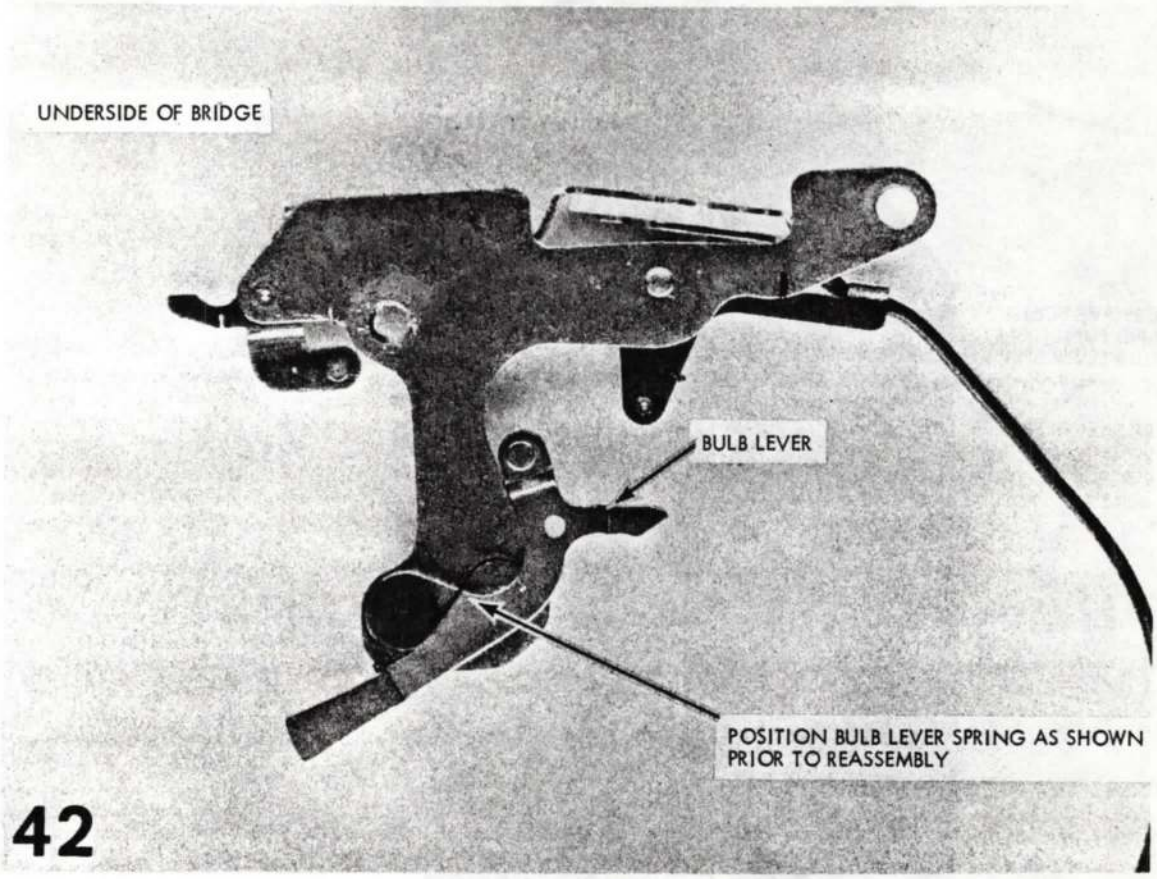

M-CONTACT CAM FOLLOWER
RIDES AGAINST EDGE OF
M-CONTACT POSITIONING CAM
SCRIBE AND REMOVE M-CONTACT
POSITIONING CAM

39

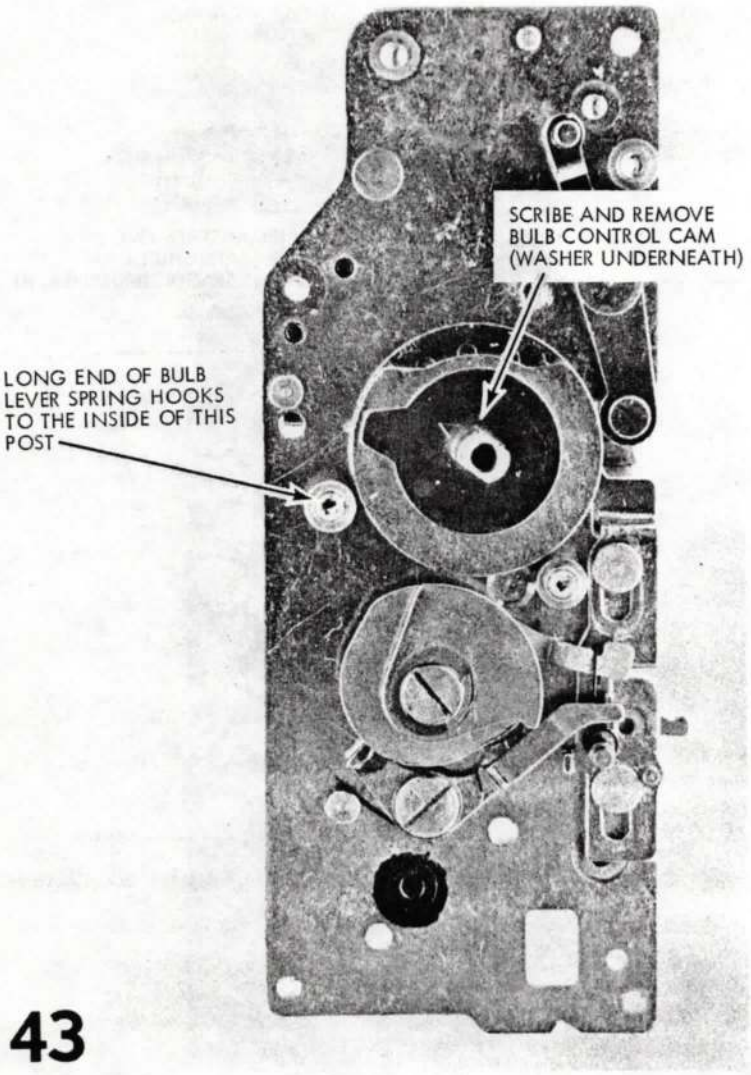

NOTE HOW BULB LEVER IS PUSHED OUT BY BULB CONTROL CAM
LIFT OUT "THICK" SPACER


REMOVE THREE SCREWS
AND LIFT OFF BRIDGE
OBSERVE POSITION
AND FUNCTION OF
BULB LEVER SPRING
BE CAREFUL YOU DO NOT
DAMAGE END OF M-CONTACT
CLOSING LEVER THAT PASSES
UNDER RETARD DRIVE CAM

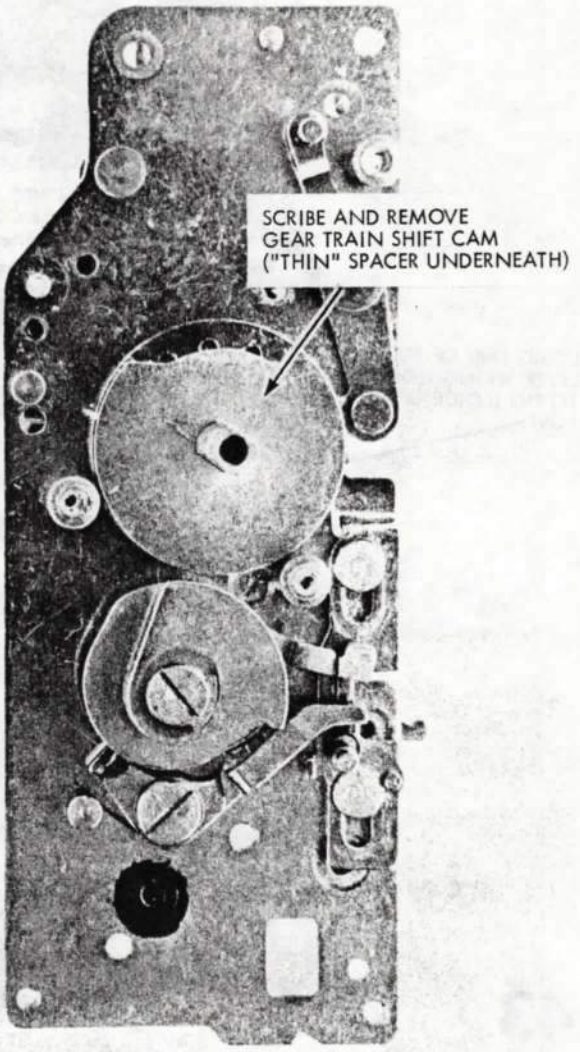
41


UNDERSIDE OF BRIDGE
BULB LEVER
POSITION BULB LEVER SPRING AS SHOWN PRIOR TO REASSEMBLY

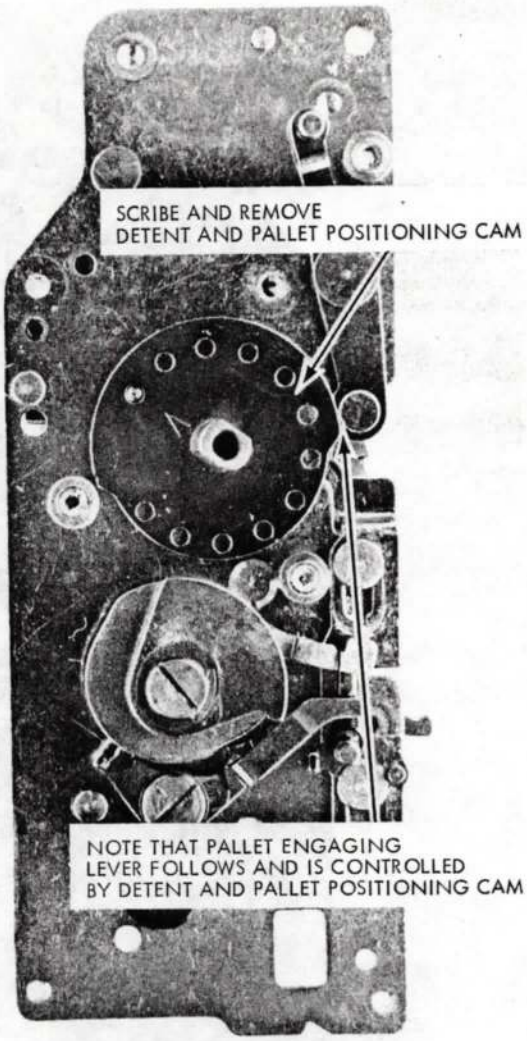
42

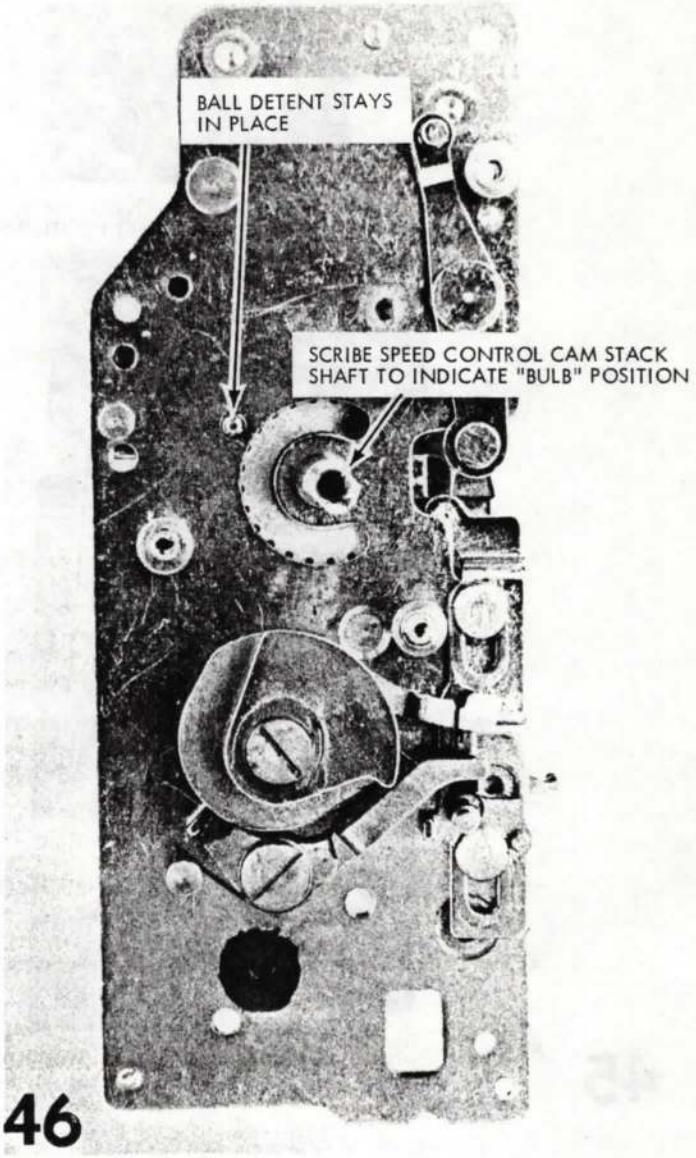

SCRIBE AND REMOVE
BULB CONTROL CAM
(WASHER UNDERNEATH)
LONG END OF BULB
LEVER SPRING HOOKS
TO THE INSIDE OF THIS
POST

43


SCRIBE AND REMOVE
GEAR TRAIN SHIFT CAM
("THIN" SPACER UNDERNEATH)

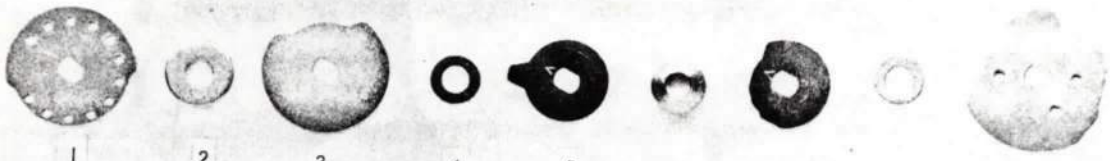
44


SCRIBE AND REMOVE
DETENT AND PALLET POSITIONING CAM
NOTE THAT PALLET ENGAGING
LEVER FOLLOWS AND IS CONTROLLED
BY DETENT AND PALLET POSITIONING CAM

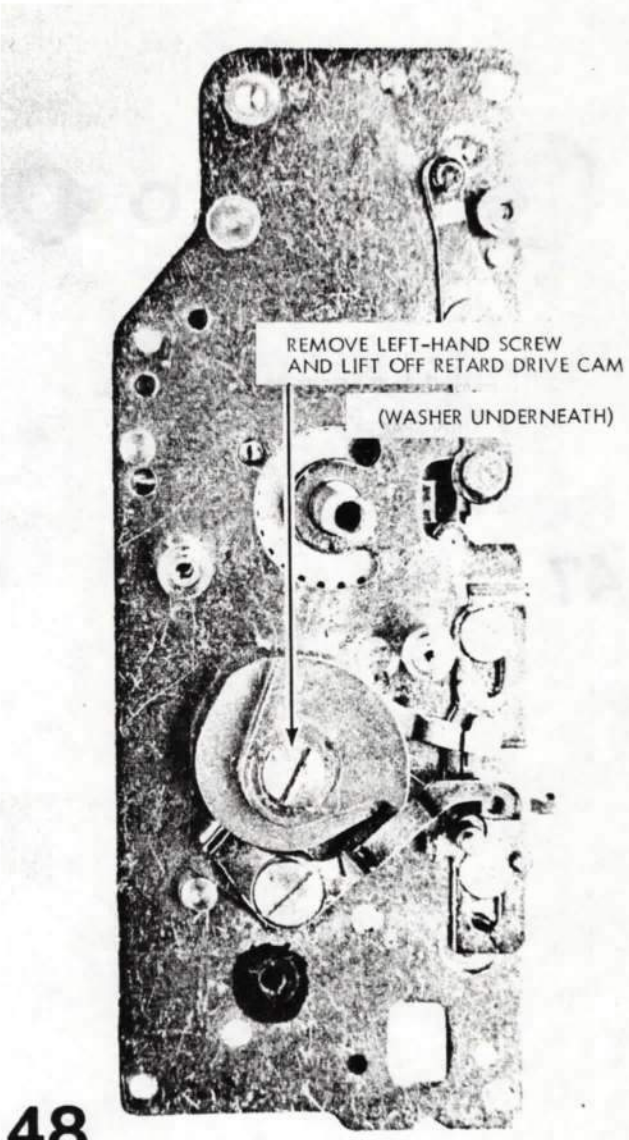

BALL DETENT STAYS
IN PLACE
SCRIBE SPEED CONTROL CAM STACK
SHAFT TO INDICATE "BULB" POSITION

46

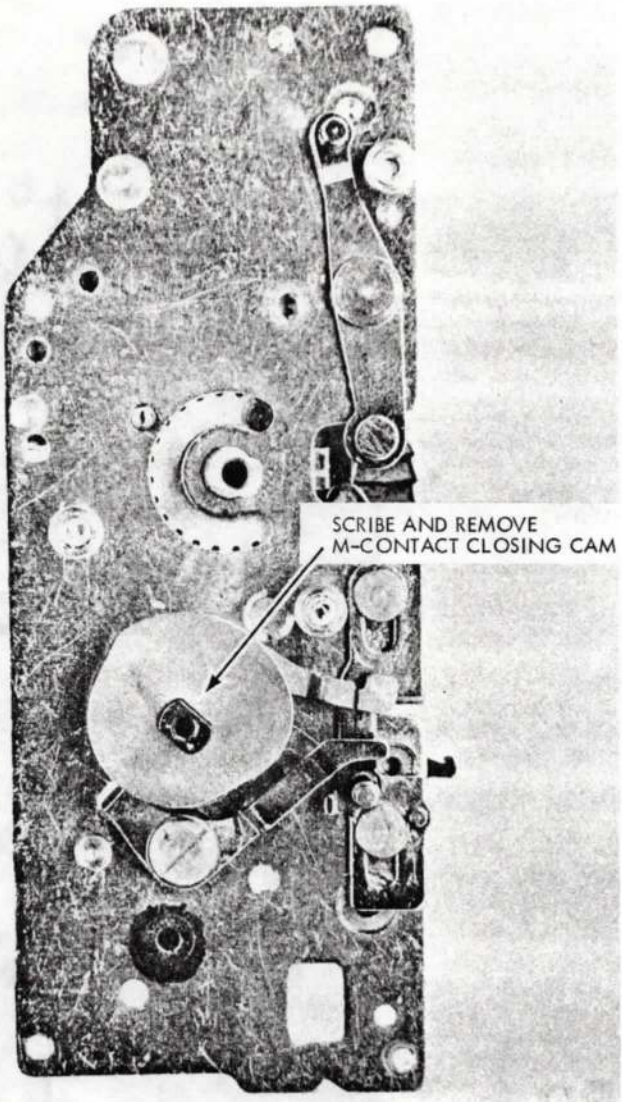
SPEED CONTROL CAMS IN ORDER OF REASSEMBLY



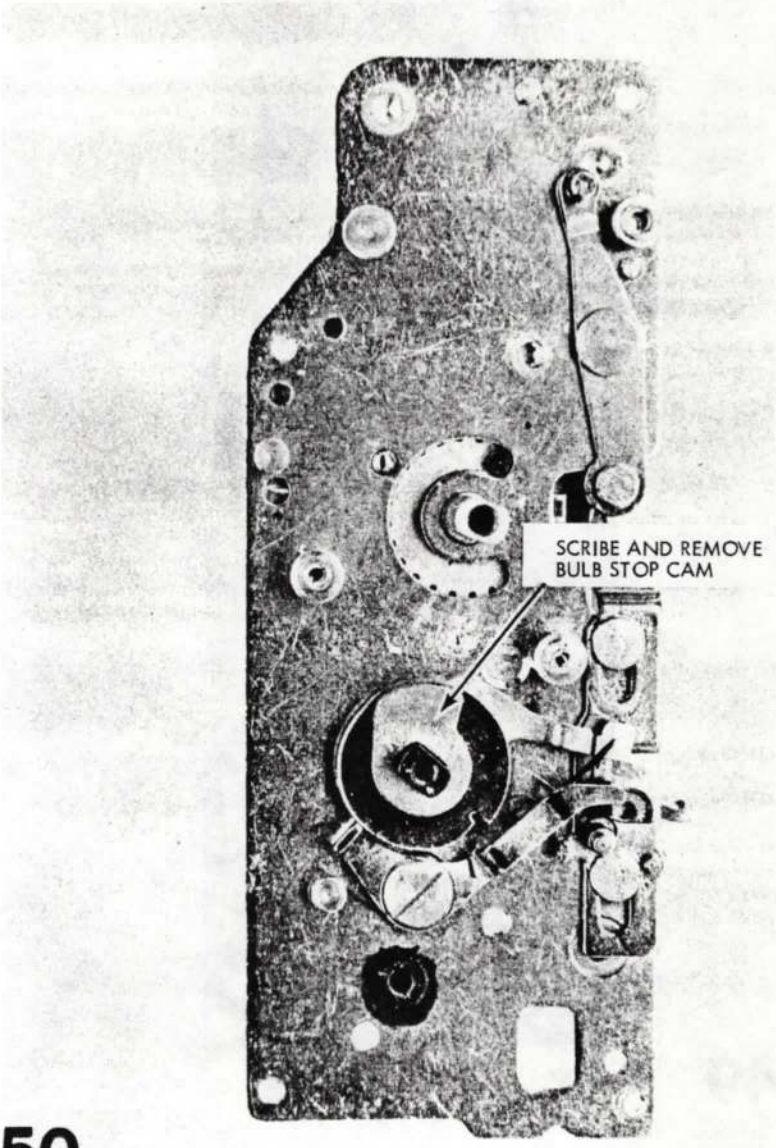
1 DETENT AND PALLET POSITIONING CAM
2 THIN SPACER
3 GEAR TRAIN SHIFT CAM
4 WASHER
5 BULB CONTROL CAM
6 THICK SPACER
7 M-CONTACT POSITIONING CAM
8 WASHER
9 RETARD CAM


REMOVE LEFT-HAND SCREW
AND LIFT OFF RETARD DRIVE CAM
(WASHER UNDERNEATH)

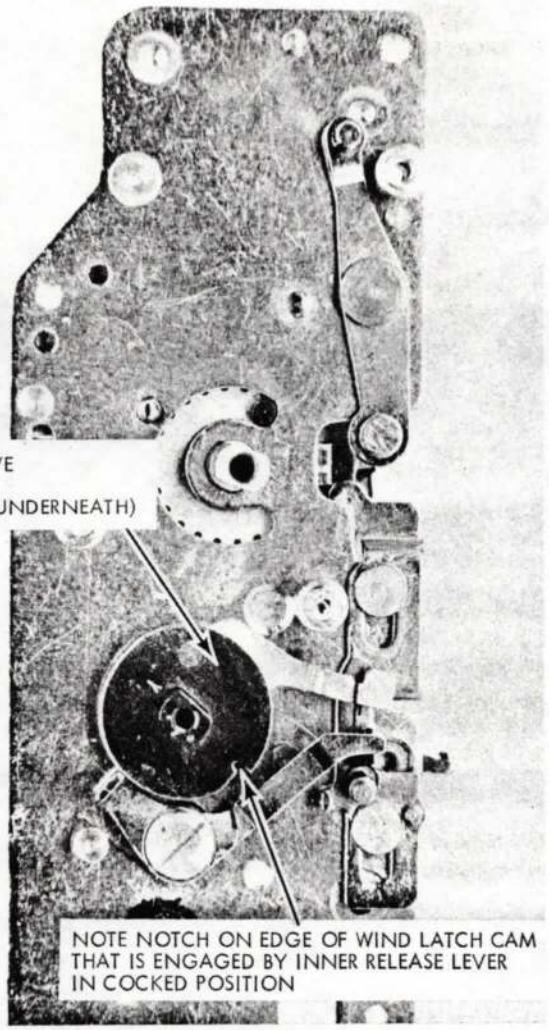
48



49



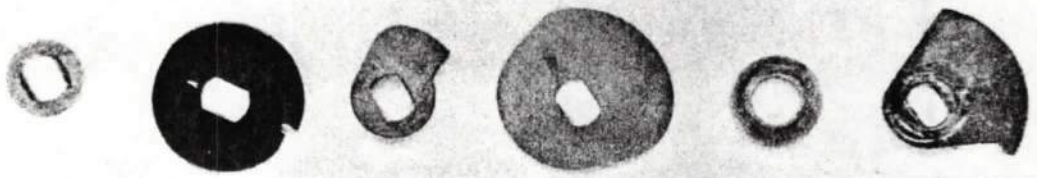
50


SCRIBE AND REMOVE
WIND LATCH CAM
("KEYED" WASHER UNDERNEATH)
NOTE NOTCH ON EDGE OF WIND LATCH CAM
THAT IS ENGAGED BY INNER RELEASE LEVER
IN COCKED POSITION

PIN ON BOTTOM OF WIND LATCH CAM CONTROLS
SPRING TENSIONING LEVER (SEE FIGURE 53)

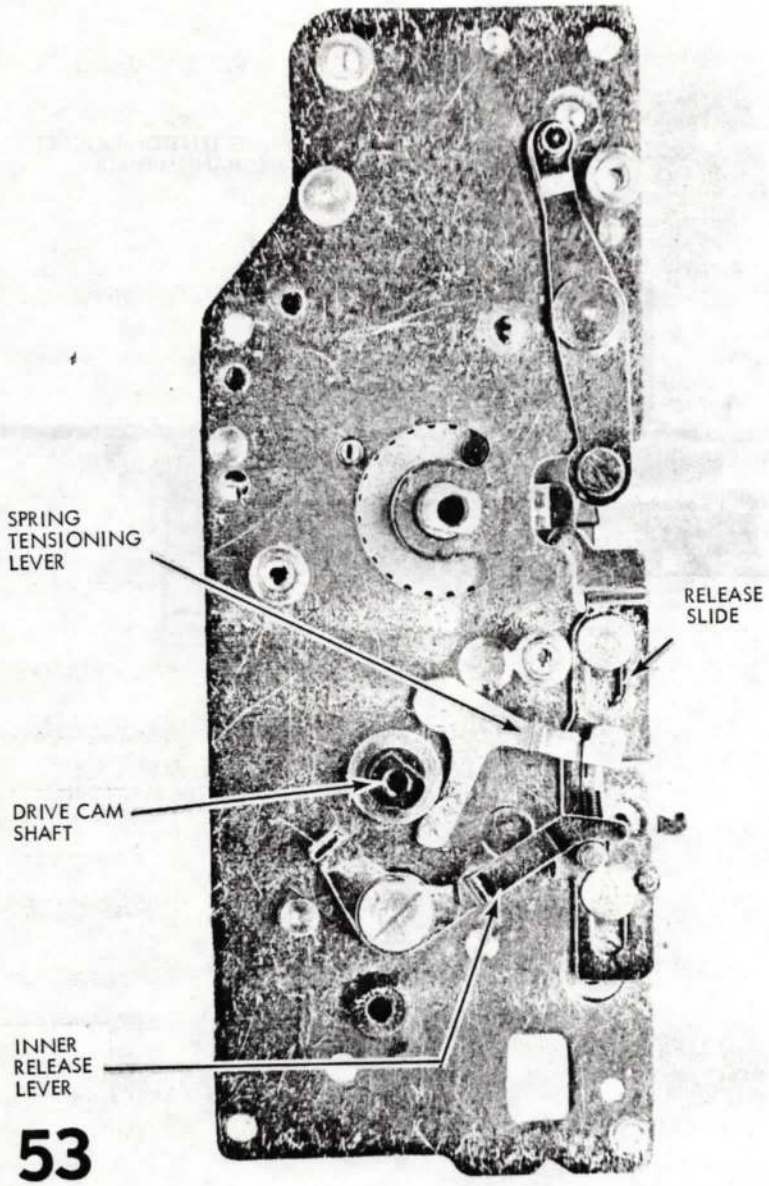
51

MAIN DRIVE CAMS, SHOWING ORDER OF REASSEMBLY



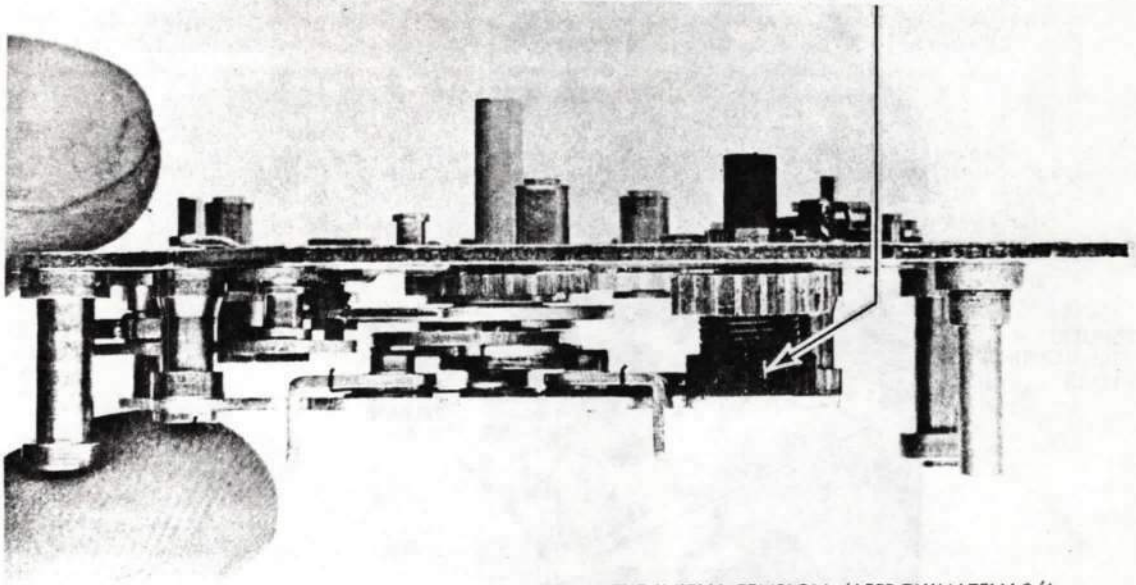
1 2 3 4 5 6

1 "KEYED" WASHER	4 M-CONTACT CLOSING CAM
2 WIND LATCH CAM	5 WASHER
3 BULB STOP CAM	6 RETARD DRIVE CAM

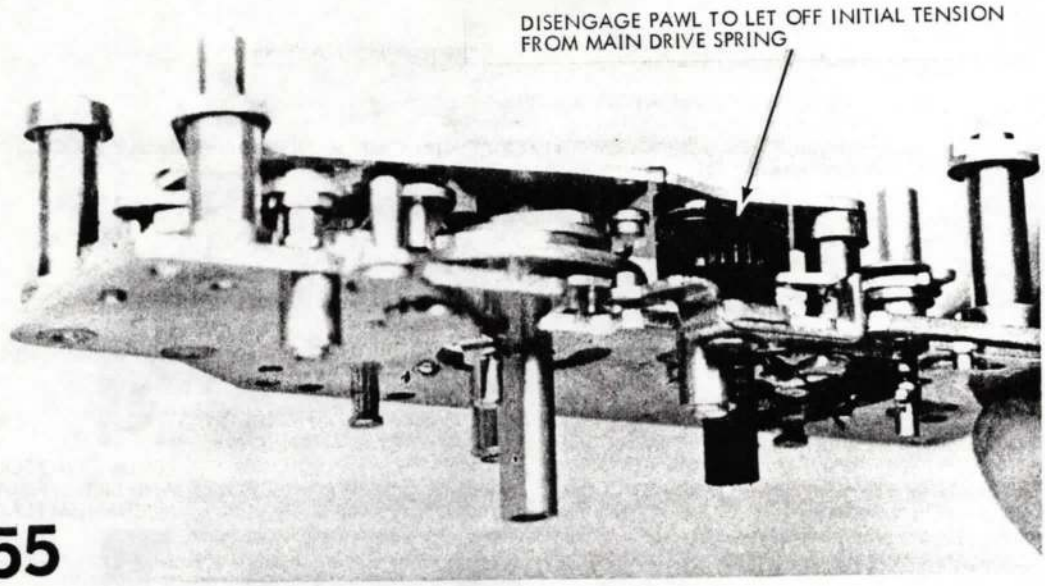

SPRING
TENSIONING
LEVER
RELEASE
SLIDE
DRIVE CAM
SHAFT
INNER
RELEASE
LEVER

53

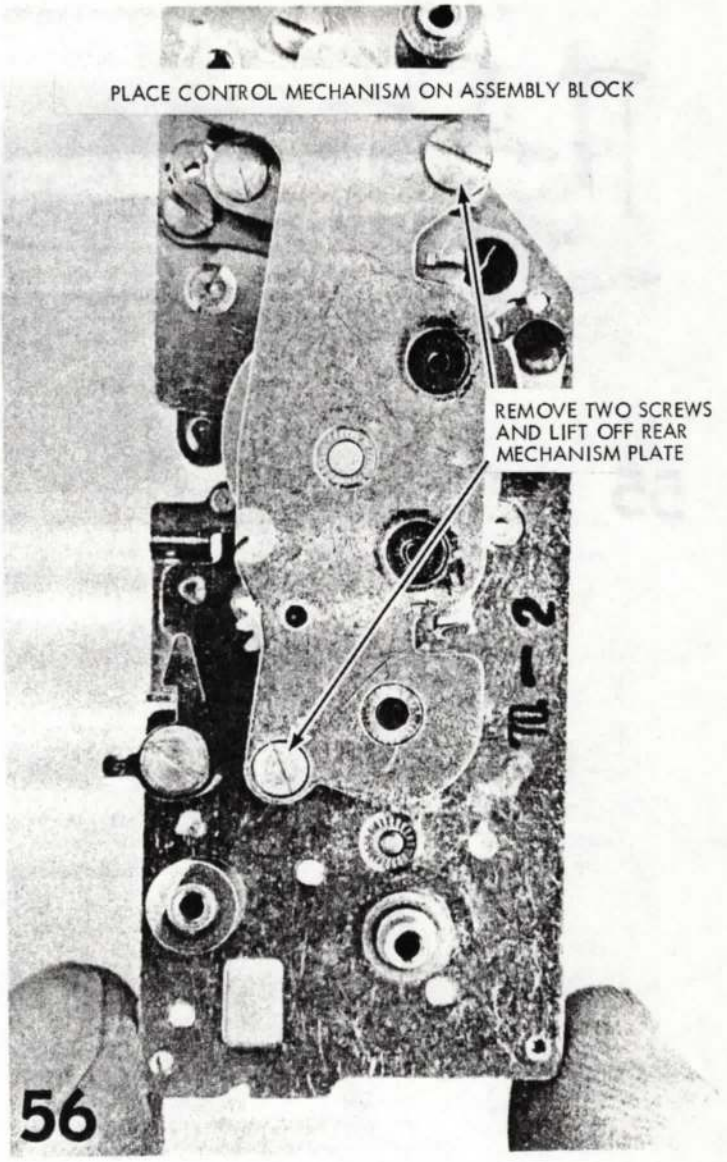
SCRIBE POSITION OF SPRING TENSION RATCHET WITH RESPECT TO REAR MECHANISM PLATE

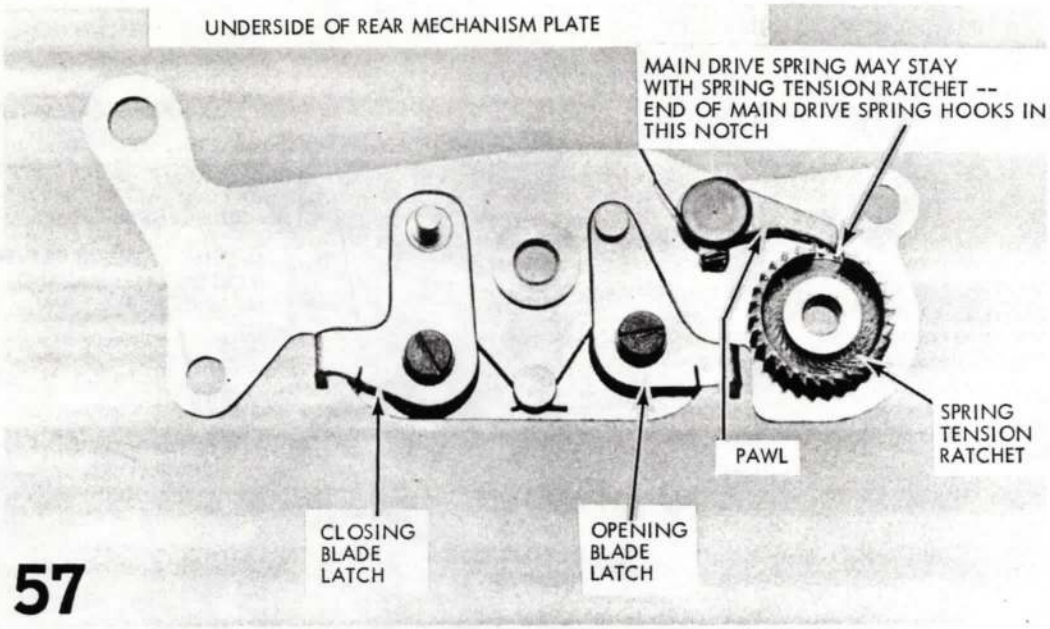


THE INITIAL TENSION (APPROXIMATELY 3/4 TURN) MUST BE REPLACED ON THE MAIN DRIVE SPRING DURING REASSEMBLY

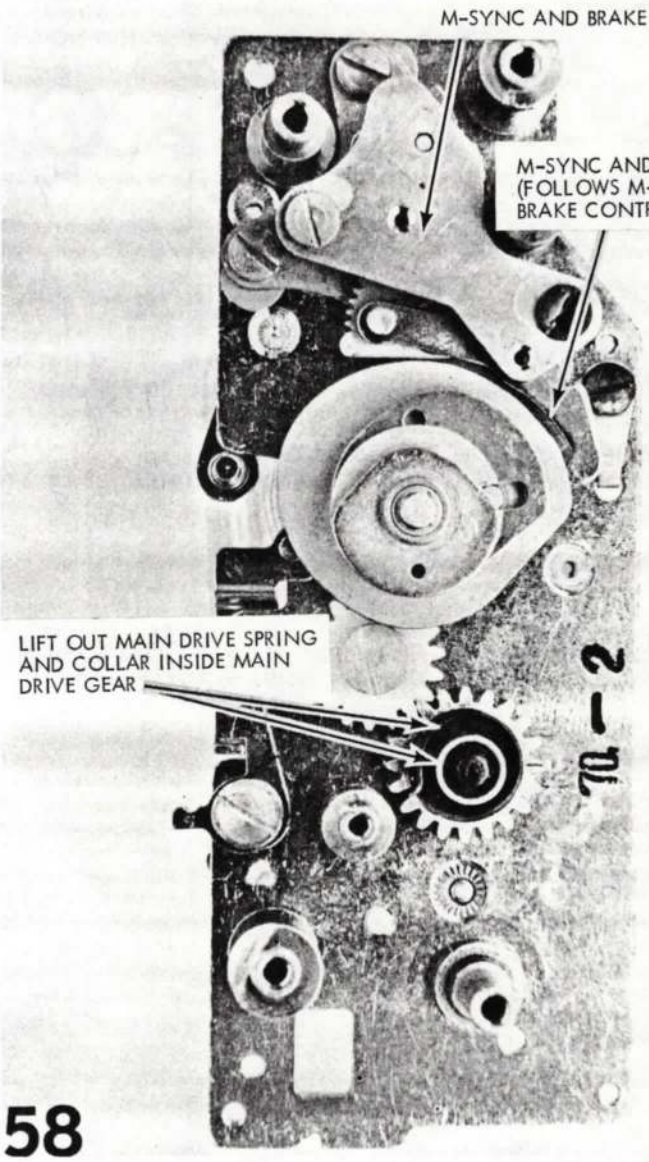

DISENGAGE PAWL TO LET OFF INITIAL TENSION
FROM MAIN DRIVE SPRING

55

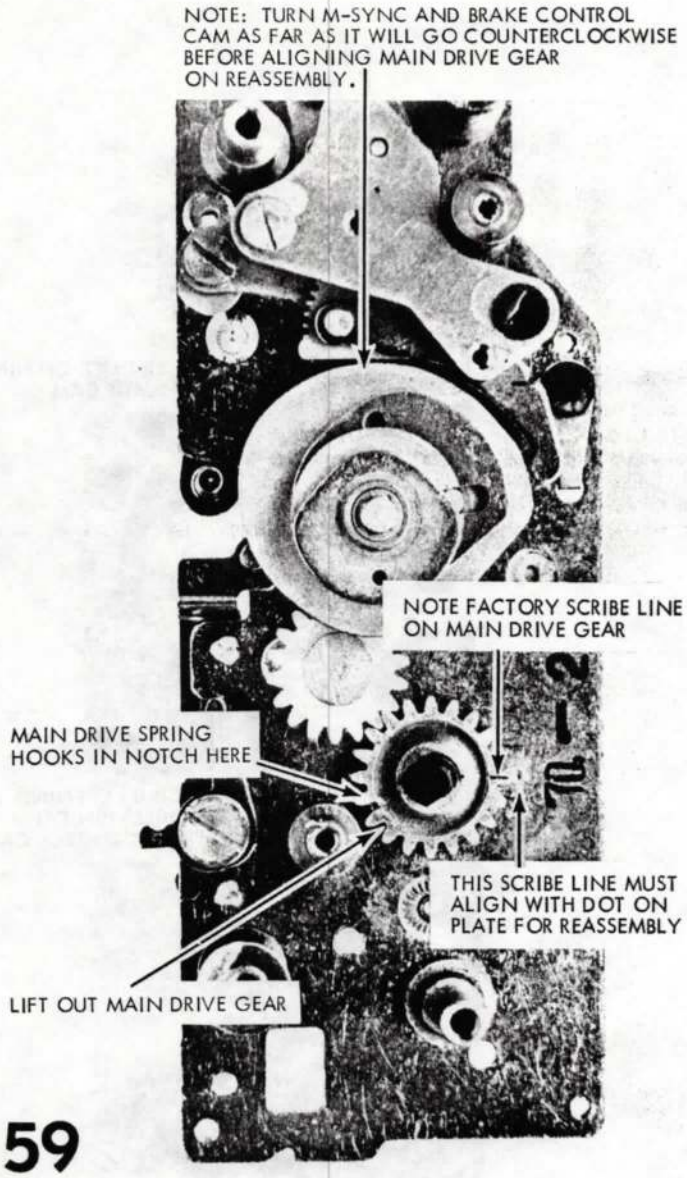

PLACE CONTROL MECHANISM ON ASSEMBLY BLOCK
REMOVE TWO SCREWS AND LIFT OFF REAR MECHANISM PLATE
56

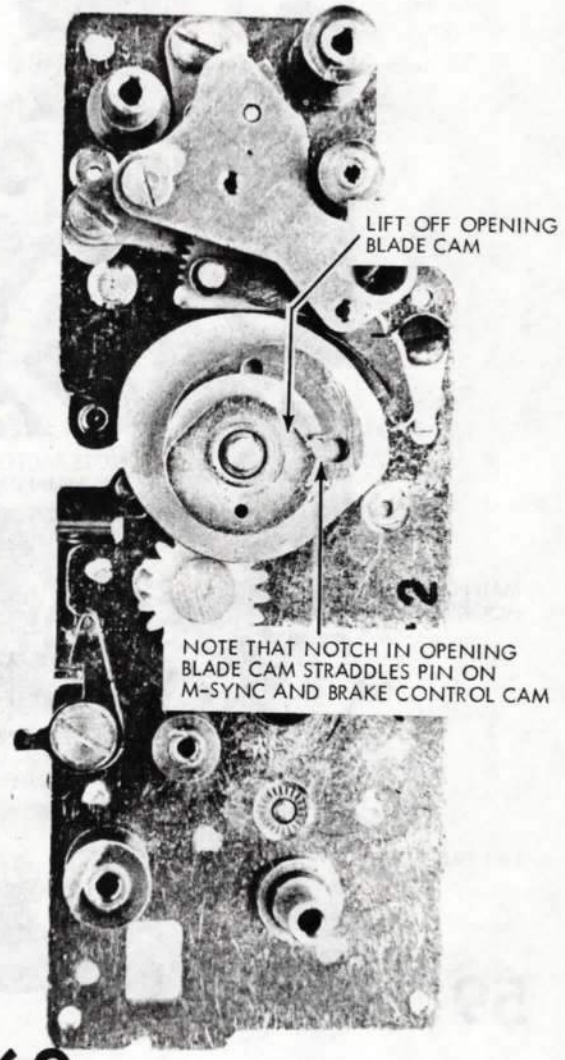

UNDERSIDE OF REAR MECHANISM PLATE
MAIN DRIVE SPRING MAY STAY WITH SPRING TENSION RATCHET -- END OF MAIN DRIVE SPRING HOOKS IN THIS NOTCH
SPRING TENSION RATCHET
PAWL
CLOSING BLADE LATCH
OPENING BLADE LATCH

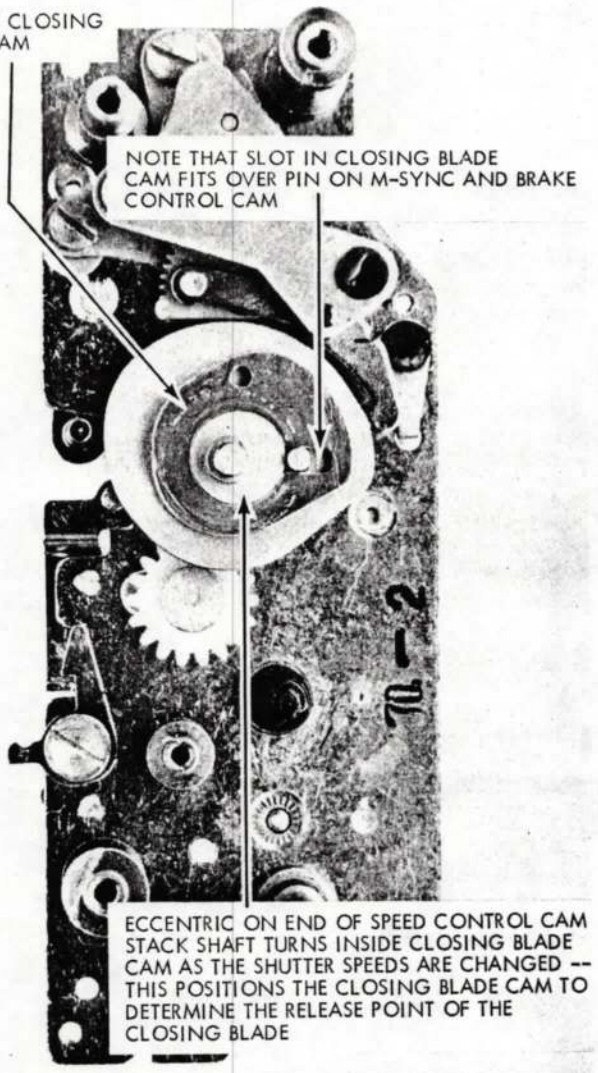
57

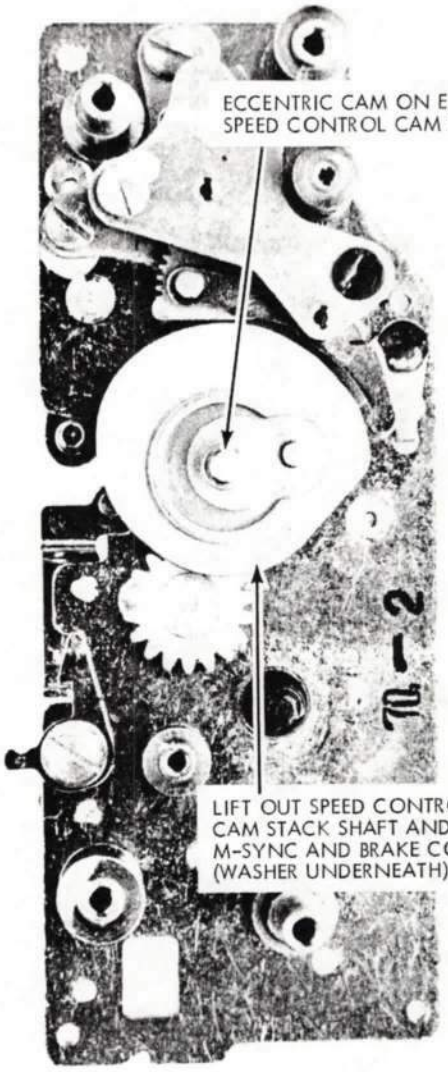
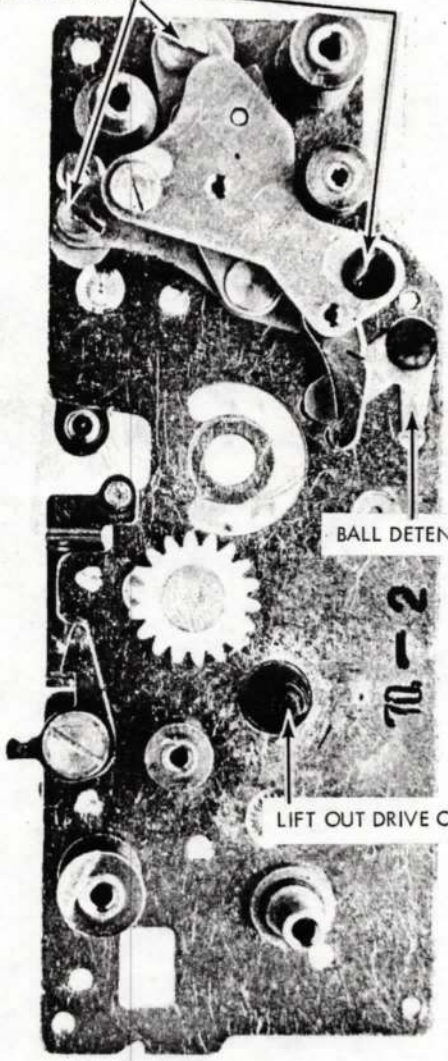

M-SYNC AND BRAKE ESCAPEMENT
M-SYNC AND BRAKE LEVER (FOLLOWS M-SYNC AND BRAKE CONTROL CAM)
LIFT OUT MAIN DRIVE SPRING AND COLLAR INSIDE MAIN DRIVE GEAR
70-2

58


NOTE: TURN M-SYNC AND BRAKE CONTROL CAM AS FAR AS IT WILL GO COUNTERCLOCKWISE BEFORE ALIGNING MAIN DRIVE GEAR ON REASSEMBLY.
NOTE FACTORY SCRIBE LINE ON MAIN DRIVE GEAR
MAIN DRIVE SPRING HOOKS IN NOTCH HERE
THIS SCRIBE LINE MUST ALIGN WITH DOT ON PLATE FOR REASSEMBLY
LIFT OUT MAIN DRIVE GEAR


LIFT OFF OPENING
BLADE CAM
2
NOTE THAT NOTCH IN OPENING
BLADE CAM STRADDLES PIN ON
M-SYNC AND BRAKE CONTROL CAM


LIFT OFF CLOSING BLADE CAM
NOTE THAT SLOT IN CLOSING BLADE CAM FITS OVER PIN ON M-SYNC AND BRAKE CONTROL CAM
ECCENTRIC ON END OF SPEED CONTROL CAM STACK SHAFT TURNS INSIDE CLOSING BLADE CAM AS THE SHUTTER SPEEDS ARE CHANGED -- THIS POSITIONS THE CLOSING BLADE CAM TO DETERMINE THE RELEASE POINT OF THE CLOSING BLADE


ECCENTRIC CAM ON END OF
SPEED CONTROL CAM STACK SHAFT
LIFT OUT SPEED CONTROL
CAM STACK SHAFT AND
M-SYNC AND BRAKE CONTROL CAM
(WASHER UNDERNEATH)

REMOVE THREE SCREWS AND LIFT OUT
M-SYNC AND BRAKE ESCAPEMENT